

AAI

AUTOMOTIVE INDUSTRIES

**AUTOMOTIVE and AVIATION MANUFACTURING
ENGINEERING • PRODUCTION • MANAGEMENT**

OCTOBER 1, 1956

NATIONAL METAL SHOW NUMBER

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**Features of Chrysler Corporation Cars for 1957
Two Fuel Injection Systems—Bendix and Holley
1957 Ford Passenger Car Line and New Continental
Latest Developments at Farnborough Air Show
Tractor Versatility Among Subjects at SAE Meeting
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A C H I L T O N P U B L I C A T I O N

STANOIL Industrial Oil **tough performer** **in delicate operation**



A. T. Wallace (right), President of Wallace Tool and Die Company, and Standard Oil lubrication specialist, H. A. Peterson, check sensitivity of new Cincinnati Hydro-Tel Milling Machine which uses STANOIL as hydraulic medium. Howard Peterson has been providing technical service to customers since joining Standard Oil. He is a graduate of General Motors Institute. Howard's customers find this experience pays off for them.

Delicate operations with metal requiring almost a surgeon's skill are every day stuff to Wallace Tool and Die Company, Indianapolis. Recently, they purchased a Cincinnati Hydro-Tel Milling Machine for their highest precision work. They selected STANOIL Industrial Oil for the hydraulic medium. The reason for choosing STANOIL: they wanted a hydraulic fluid that could deliver high performance. They wanted a clean hydraulic system, free of deposits that might clog filters and interrupt operations. They wanted smooth operation without pump chatter and without foam. They got these with STANOIL.

How did Wallace Tool and Die come to choose STANOIL? The answer is not hard to find. They had used STANOIL for hydraulic systems throughout their plant for many years. It has given them the results they wanted so it was natural to pick STANOIL for their new Cincinnati machine.

With STANOIL the machine performs the delicate operation of contour tracing with only 3½ ounces of pressure needed to control the milling cutters. STANOIL gives them smooth, steady, uninterrupted performance.

STANOIL can serve you. In the Midwest a lubrication specialist at your nearby Standard Oil office will be glad to show you. Call him. Or contact Standard Oil Company, 910 South Michigan Avenue, Chicago 80, Illinois.



STANDARD OIL COMPANY (Indiana)

Another construction problem solved . . . by COTTA HEAVY-DUTY TRANSMISSION

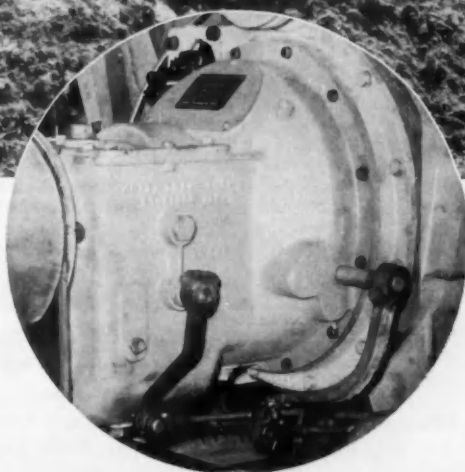


Insley "Pipeliner" at work digging 30 in.
gas line near Edinburgh, Ind.

With a special problem to solve, Insley engineers found that a Cotta transmission could easily be adapted for a quick, reliable solution.

On the job illustrated, the new Insley "Pipeliner" excavator digs out turns and rock formations left by the speedier light-duty ditching machine. To facilitate rapid movement from location to location, the excavator was equipped with a special Cotta transmission having one to one forward ratio for digging, and two to one overspeed to keep up with pipeline operations.

If you need large- or small-quantity production of special-purpose or specially engineered heavy-duty transmissions, why not call Cotta? Cotta engineers can supply or design a gear box that will give you dependable, trouble-free service under the toughest conditions. Diagrams and complete specifications sent free on request.



Broad range of ratios

Input torques from 150 to 1,350 ft lbs

For use on cranes, shovels, rock crushers,
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THIS INFORMATION WILL HELP YOU

Sent free on request — diagrams, capacity tables, dimensions, and complete specifications. State your problem — COTTA engineers will help you select the right unit for best performance. Write today.

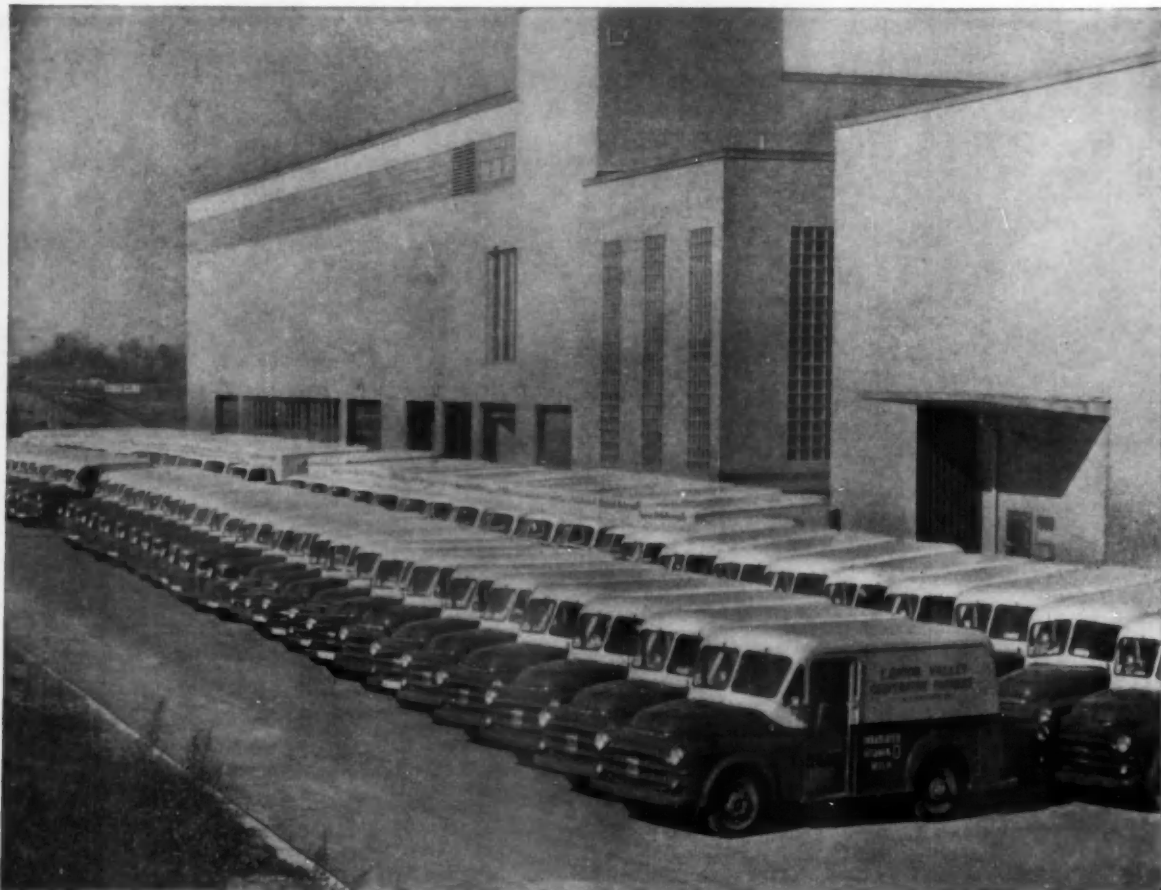
COTTA TRANSMISSION CO., ROCKFORD, ILLINOIS



COTTA

**HEAVY-DUTY
TRANSMISSIONS**

"Engineered-to-order"



A great fleet . . . with bodies able to take day-in day-out dairy route punishment. These bodies withstand the strains of stop-and-go driving, attacks of weather, water and general hard use, yet mainte-

nance is minimum. Because they are designed to utilize the properties combined in high strength low alloy steels containing nickel. Built by Boyertown Auto Body Works, Inc., Boyertown, Penna.

Nickel alloy steel helps body builder provide more strength...per pound...per dollar

Light, strong and corrosion-resisting...the truck bodies for this fleet were designed by Boyertown Auto Body Works, Inc., to utilize properties of a money-saving structural material — *high strength low alloy nickel-copper steel*.

As-rolled, without heat-treatment, steels of this type show a 50,000 psi minimum yield point, or about $1\frac{1}{2}$ times that of plain carbon structural steel. Sheet gauges may be cold formed into structural panels that cut weight substantially, without sacrifice of strength or safety.

In addition, high strength low alloy nickel-copper steels offer 4 to 6 times greater resistance to atmospheric corrosion than do carbon steels. Thus, they retain a high degree of original strength. They also

offer superior resistance to shock, battering and abrasion. As a result, use of these nickel steels extends the life of fabricated structures.

Moreover, high strength low alloy nickel-copper steels readily respond to fabrication processes, including welding. These steels, containing nickel along with other alloying elements, are marketed under a variety of trade-names by leading steel companies.

Get full details in "Nickel-Copper High Strength Low Alloy Steels" . . . *your manual* for the asking. It discusses design factors that cut weight safely, explains why these alloy steels resist atmospheric and other types of corrosion, describes behavior in fabrication, and illustrates scores of applications. Write for this manual now.



THE INTERNATIONAL NICKEL COMPANY, INC. 67 Wall Street
New York 5, N. Y.

AUTOMOTIVE INDUSTRIES

A CHILTON MAGAZINE PUBLISHED SEMI-MONTHLY

OCTOBER 1, 1956

VOL. 115, NO. 7

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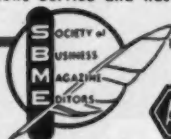
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MEMBER



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44% FASTER



NEW ROTOR D-4 GRINDER pays for itself in one month



ASK FOR
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NO. 43

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FORMERLY: Used 4500 rpm grinders. Output: 50 pieces per day.

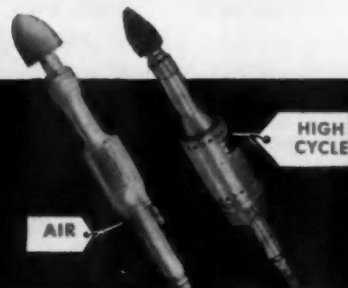
NOW: Use new Rotor D-4 8500 rpm Grinders. Output: 72 pieces per day.

RESULTS: 44% more output paid off cost of new Rotor Grinders in one month. After that, it's pure savings.

Find out from your nearby Rotor Analyst how *you* can cut costs with the D-4 and other new Rotor portable tools! Ask for a demonstration.

THE **ROTOR TOOL** CO.
CLEVELAND, OHIO

UNBIASED ANALYSIS OF PORTABLE TOOL PROBLEMS



Welding Output Increased

on
*Western Electric
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*In Canada, made and sold by Johnson Matthey and
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For information on titanium developments, contact Mallory-Sharon Titanium Corp., Niles, Ohio

AUTOMOTIVE INDUSTRIES, October 1, 1956

Suppose you needed to spot-weld sheet steel to steel forgings, in hard-to-reach locations. Western Electric's plant at Indianapolis had this problem on telephone coin boxes. Custom-designed electrodes and holders had seemed the way to do the job.

But, since using a standard Mallory heavy-duty offset holder and Mallory bent tips, their welding costs have been reduced and production rate has been increased.

Output increased. The number of parts welded per shift has been increased significantly. Reason: less tip dressing, less setup time loss, cooler operation and minimum respotting.

Longer electrode life. Replacement rate is now less. Reason: better cooling of electrodes . . . all the way to the tip.

Less down time. Re-dressing is now needed only once per shift.

Chances are that you, too, can make substantial savings in resistance welding production, by using Mallory electrodes, holders, seam welding wheels, dies, castings and forgings . . . and by taking advantage of Mallory engineering service in applying these products effectively to your problem. See your local Mallory welding distributor for prompt service, and write to us for our resistance welding catalog.

Expect more . . . Get more from

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MALLORY

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"Running this CUT MASTER

**is as easy as taking candy
from a baby"**



BULLARD

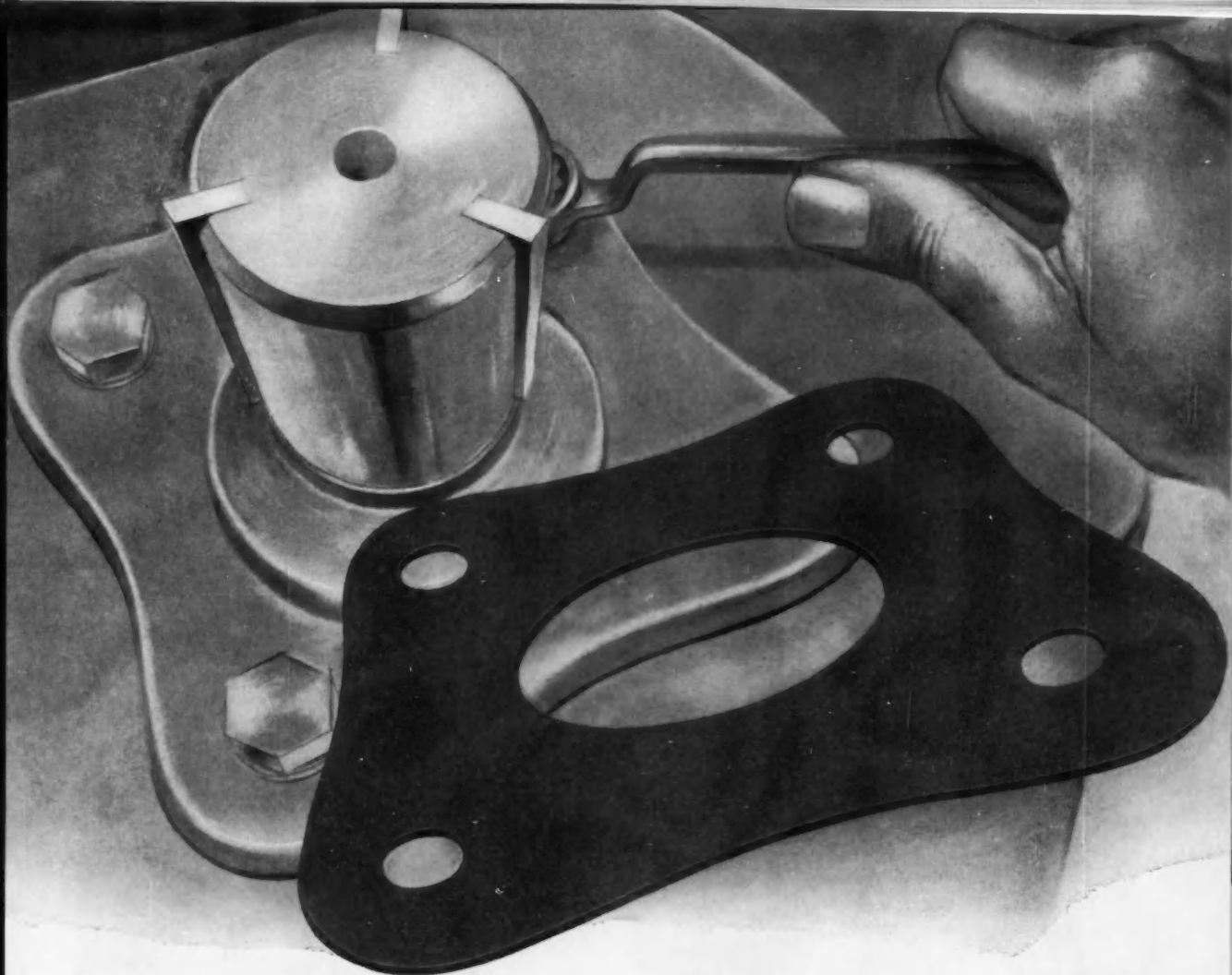
Thus, V.T.L. operator Joseph
Walent at Crosby Steam Gage &
Valve Co. summarizes his comments on
their new 26" Bullard Cut Master, Model 75.



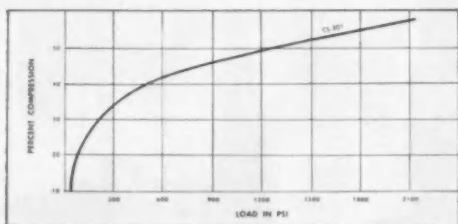
"With the movable Pendant Control I can work from the most advantageous position. You'd be surprised how much easier the Pendant Control makes it for me. It increases my production too, to have all the controls in one spot — no running back and forth from one control to another." This feature of the new line of Bullard Cut Master, Model 75 is only one of many reasons why you should have them in your plant.

Why not get the full story —
ask for a catalog by calling
your nearest Bullard Sales Of-
fice, Distributor or write

**THE BULLARD COMPANY
BRIDGEPORT 9, CONN.**



Accopac® fiber gasket seals tightly under stamped flanges



HIGH COMPRESSIBILITY of CS-301 Accopac is shown by load-compression curve. With light metal flanges, this compressibility allows gaskets to conform to surface irregularities and form a tight seal without distorting flange.

Armstrong CS-301 Accopac® is a highly compressible fiber gasket material that forms a tight seal against fluids even under the low bolting pressures available with stamped flanges.

CS-301 is made by a patented beater saturation process that locks cellulose fibers and cork in a non-extractable latex binder. The cork—thousands of tiny, springy particles—gives CS-301 its high, uniform compressibility. And although CS-301 is unusually compressible, it retains bolt torque well at flange pressures under 2000 psi at temperatures up to 200° F.

CS-301 is a dependable seal for water, air, most gases, and many commonly used solvents. It is now being used for many applications in automobiles, tractors, appliances, and industrial equipment.

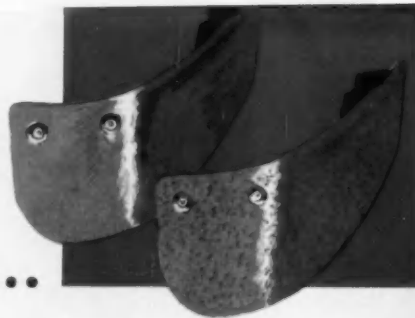
For more information about Armstrong CS-301 Accopac, write Armstrong Cork Company, 7010 Imperial Avenue, Lancaster, Pennsylvania.



Armstrong ACCOPAC

... used wherever performance counts

Textures in Steel...



*New style
from Old Dies*
is possible by altering
the surface patterns of
the metal.

MAKE AUTOMOTIVE DESIGNING EASIER

SINCE rolled-in design patterns in steel were first developed at Sharon, more and more product stylists are finding ways in which it makes their jobs easier.

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If you are not already familiar with this exciting metal, why not contact your Sharon representative today and get all the details.



*Won't mark or
show scratches!*
Ideal for spots that must
take extra heavy wear.

SPECIFY

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10028

Smart distinctive appearance

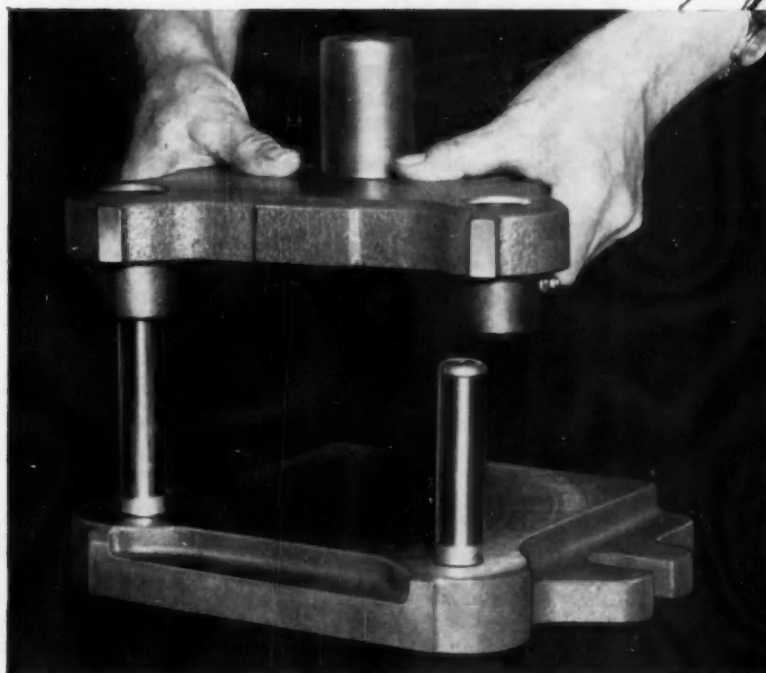
can be easily achieved through
discriminative use of this
textured surface steel.

*SHARONART—Trademark registered by the Sharon Steel Corporation.

NEW

Easy Punch Holder Removal

ON **NEW** DANLY DIE SETS




Danly's leadership in die set design is seen in another improvement . . . easier removal of punch holders. On ordinary sets, punch holders often bind near the top of the guide posts as they are being removed. Standard Danly Die Sets are assembled with one post a half-inch shorter than the length specified . . . thus, the punch holder swings free before binding can occur. Isn't this another important reason why you should specify die sets from Danly?



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"leadership line" catalog
More than 200 pages provide you with
complete design information, easier
selection of die sets and supplies.
Write for your copy today!

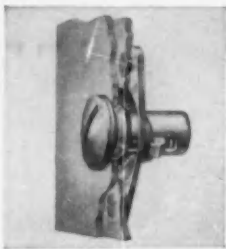
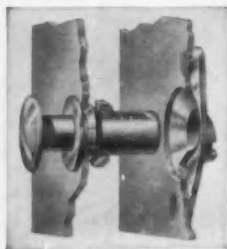


**DANLY MACHINE
SPECIALTIES, INC.**

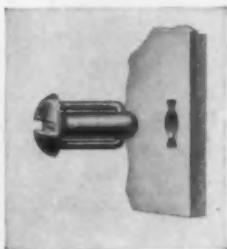


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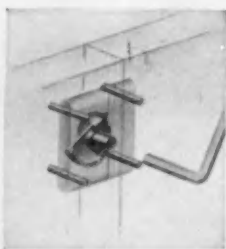
3 ways to save on assembly costs



QUICK-LOCK For fastening removable access doors and panels. Because of its ease of installation, QUICK-LOCK is ideal for assembling removable panels. A 90° turn locks it in place. Stud is self-ejecting when unlocked; visual inspection shows whether fastener is locked. Spring loading takes initial load; solid supports carry increased load. Available in a wide range of sizes.



SPRING-LOCK One-piece fastener for blind holes has load-carrying steel spring wire. Spring steel arms lock fastener securely, prevent loosening under vibration. SPRING-LOCK will work with varying panel thicknesses, locks with a twist of the wrist. Made in all-metal and plastic with steel insert. The molded design permits heads to be made in various shapes for refrigerator shelf supports, washer knobs, brackets. Available in a wide variety of shapes and sizes, and also in custom designs.



ROTO-LOCK Serrated, tapered cam is engaged by formed lug as fastener is locked. Cam action draws panels together tightly, insures locking even under conditions of misalignment. Opens easily for demounting. ROTO-LOCK carries heavy tension and shear loads; can be used for air and water-tight seals; recesses completely into panels. Solidly built without springs or delicate mechanical parts, unaffected by arctic temperatures or field service.

Simmons

QUICK-LOCK
SPRING-LOCK
ROTO-LOCK
LINK-LOCK
DUAL-LOCK

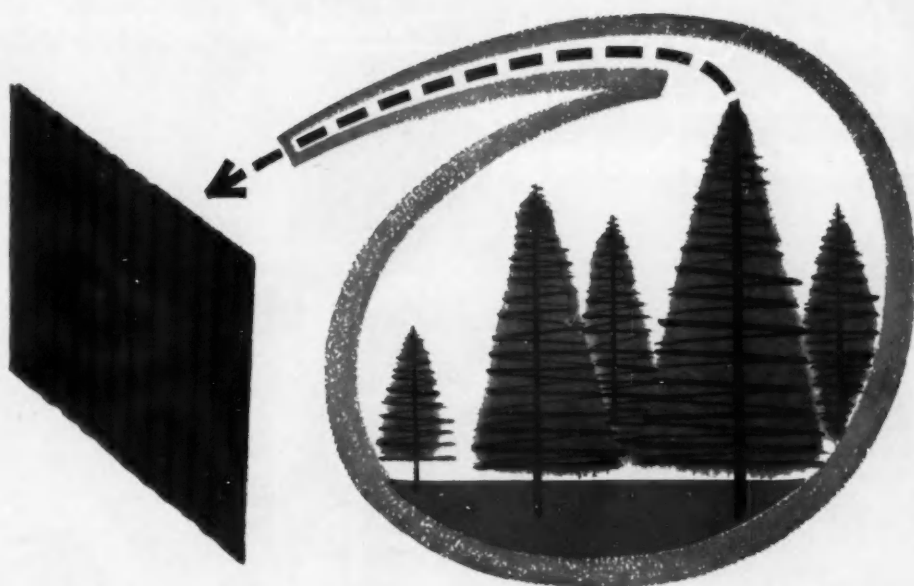
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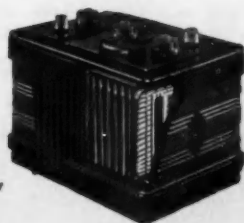


NOW modern wood chemistry brings you **better** battery separators!

When you start with wood to make a good, low-cost battery separator, you retain all of wood's advantages. Then, when you apply Evans' newly developed chemical processes—using Evans' new production equipment—you get the *extras*, like high uniform porosity, extremely high acid resistance, superior wettability and permeability, low web thickness, outstanding mechanical

strength in the battery, and resistance to abrasion and oxidization. Controlled swelling after insertion in the battery results in a tight element which resists vibration under every road condition.

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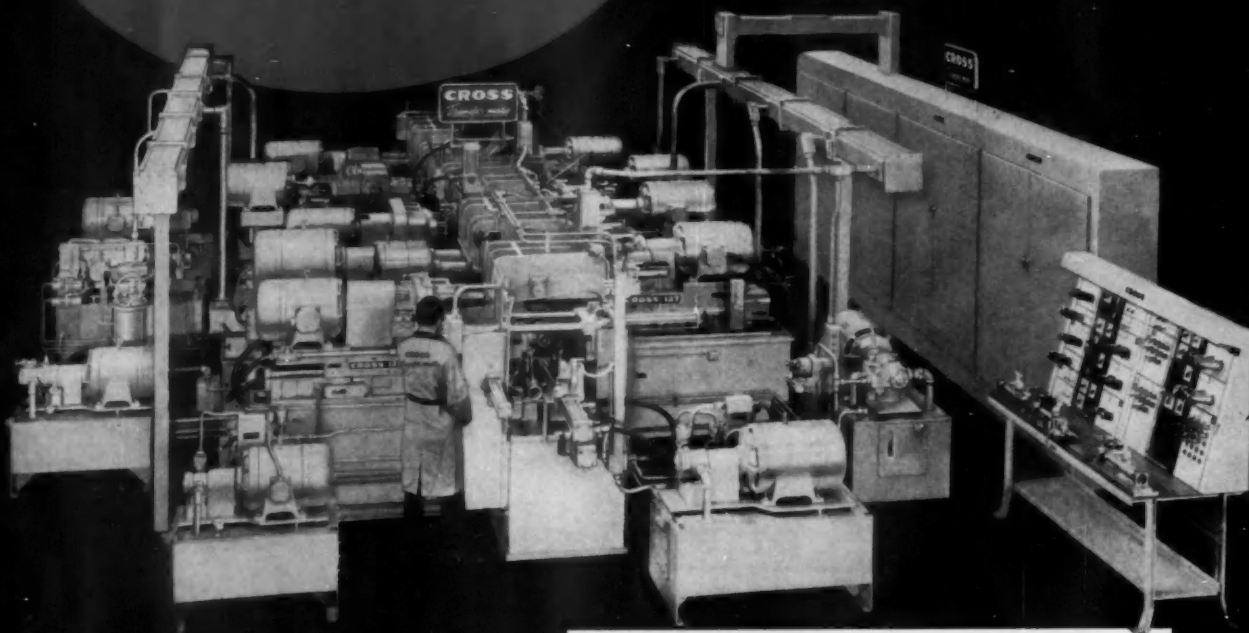
EVANITE

is a registered trademark of Evans Products Company

EVANS PRODUCTS COMPANY also produces: bicycles and velocipedes; DF railroad loading equipment; truck and bus heaters and ventilating systems; and Evaneer fir plywood

Bores, Drills Chamfers, and Taps Rear Axle Housings

Another Transfer-matic by Cross

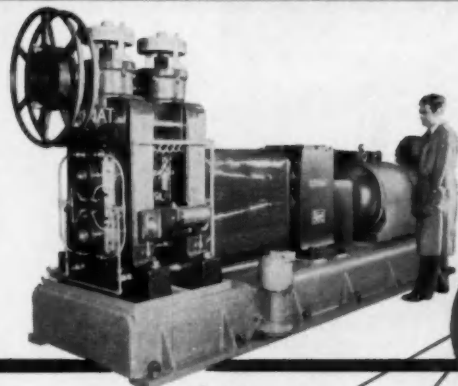


- ★ Rough and finish bores two tube holes; rough and semi-finish bores differential case bearing seats; rough and semi-finishes pinion shaft bore; drills, chamfers and taps ten cover screw holes.
- ★ 75 pieces per hour at 100% efficiency.
- ★ Twenty-two stations: one for loading, one for unloading, four for boring, two for back-boring, two for drilling, one for tapping, one for turn-over and ten for inspection.
- ★ Lift and carry transfer mechanism.
- ★ Cross Modular Unit Construction provides flexibility for part design changes.
- ★ All parts in Cross Machines—even details—are made to interchangeable tolerances for fast, easy maintenance.
- ★ Other features: Construction to JIC standards, hardened and ground ways, hydraulic feed and rapid traverse for boring and drilling, individual lead screw feed for tapping, automatic lubrication.

Established 1898

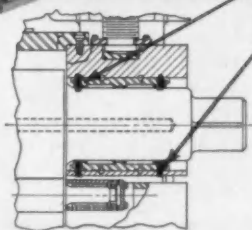
THE **CROSS** CO.
First in Automation
DETROIT 7, MICHIGAN

7-inch Waldes Truarc retaining rings cut costs, speed assembly-disassembly of 2-high/4-high mill

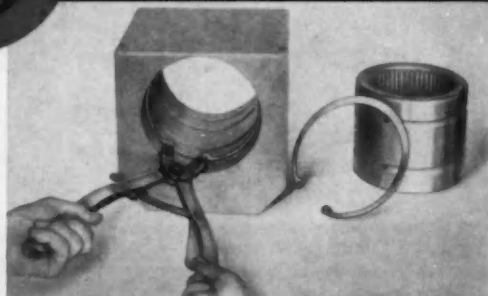


New Model TA-625 2-high/4-high combination rolling mill designed by Stanat Manufacturing Co., Long Island City, N. Y., reduces 2½" ingot to precision-rolled strip as thin as .001".

Waldes Truarc retaining rings help make possible a complete change of work rolls in 20 minutes...solve difficult problems of accuracy control by achieving positive location of bearings to extremely close tolerances. Rings eliminate costly parts and machining, save space, reduce maintenance.



In the assembly illustrated above, 7" Waldes Truarc (Series 5000) retaining rings—three on each roller—are used to position heavy-duty needle bearings in the bearing housing. Smaller rings position bearings in other roller assemblies and retain the shaft of a dual handwheel screwdown. All in all, 18 Waldes Truarc rings are used in the mill. They replace machined shoulders, spacers and lock nuts...eliminate costly threading, other machining operations.



Assembly is simple, even with giant 7" diameter Truarc ring. Special Truarc ratchet pliers grasp the ring securely, ease it into the groove, snap it securely into position. Smaller pliers and various high-speed assembly jigs are available for other rings, permit assembly-disassembly to be performed rapidly even by unskilled labor.

Whatever you make, there's a Waldes Truarc Retaining Ring designed to improve your product...to save you material, machining and labor costs. Quick and easy to assemble and disassemble, they do a better job of holding parts together. Truarc rings are precision-engineered and precision-made, quality controlled from raw material to finished ring.

36 functionally different types... as many as 97 differ-

ent sizes within a type... 5 metal specifications and 14 different finishes. Truarc rings are available from 90 stocking points throughout the U.S.A. and Canada.

More than 30 engineering-minded factory representatives and 700 field men are available to you on call. Send us your blueprints today...let our Truarc engineers help you solve design, assembly and production problems...without obligation.

For precision internal grooving and undercutting...Waldes Truarc Grooving Tool!



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RETAINING RINGS

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brings Truarc Catalog RR 9-52 up to date.

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AI 100

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When Pierce-Arrow styling was on the UP-and-UP-

who bothered to keep
bulky seating down?

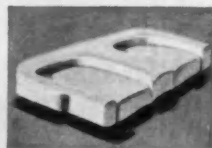
But what to do
when high style gets
lower and lower?



Airfoam—T. M. The Goodyear Tire & Rubber Company, Akron, Ohio



AIRFOAM makes interiors
roomier, more luxurious



Premolded **AIRFOAM**
replaces expensive handwork
—looks even richer—



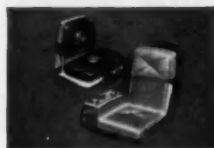
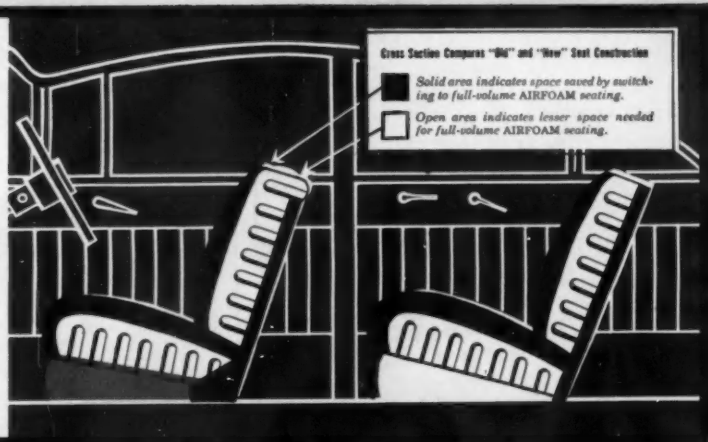
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looks and custom rides

Airfoam MADE ONLY BY **GOOD**

THE WORLD'S FINEST, MOST MODERN CUSHIONING



**AIRFOAM does
this:**
(making more room for
comfort—and sales!)



Exciting new seating ideas
become practical with AIRFOAM



AIRFOAM can be your
greatest sales-aid in years

TO KEEP UP WITH EXTERIOR DESIGN, interiors must really keep down to it. This presents king-size problems when designers are stuck with outdated upholstering methods and materials.

AIRFOAM, a completely new and different cushioning medium, is not in lock-step with the past—and AIRFOAM Development Engineers, working with foremost automobile manufacturers, are pursuing this timely advantage.

NEW AIRFOAM SEAT-UNITS are replacing old-time bulky assemblies. New economies are becoming routine—and interiors are gaining style, glamour, comfort—AND priceless R-O-O-M!

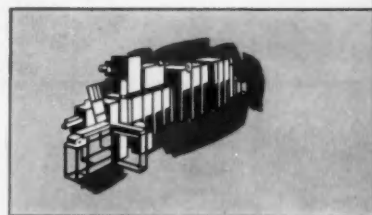
AND THAT'S ONLY THE BEGINNING! The most recent space engineering by AIRFOAM is creating quite a stir in *forthcoming* lines. May we show you some significant findings? Goodyear, Automotive Products Dept., Akron 16, Ohio.

YEAR

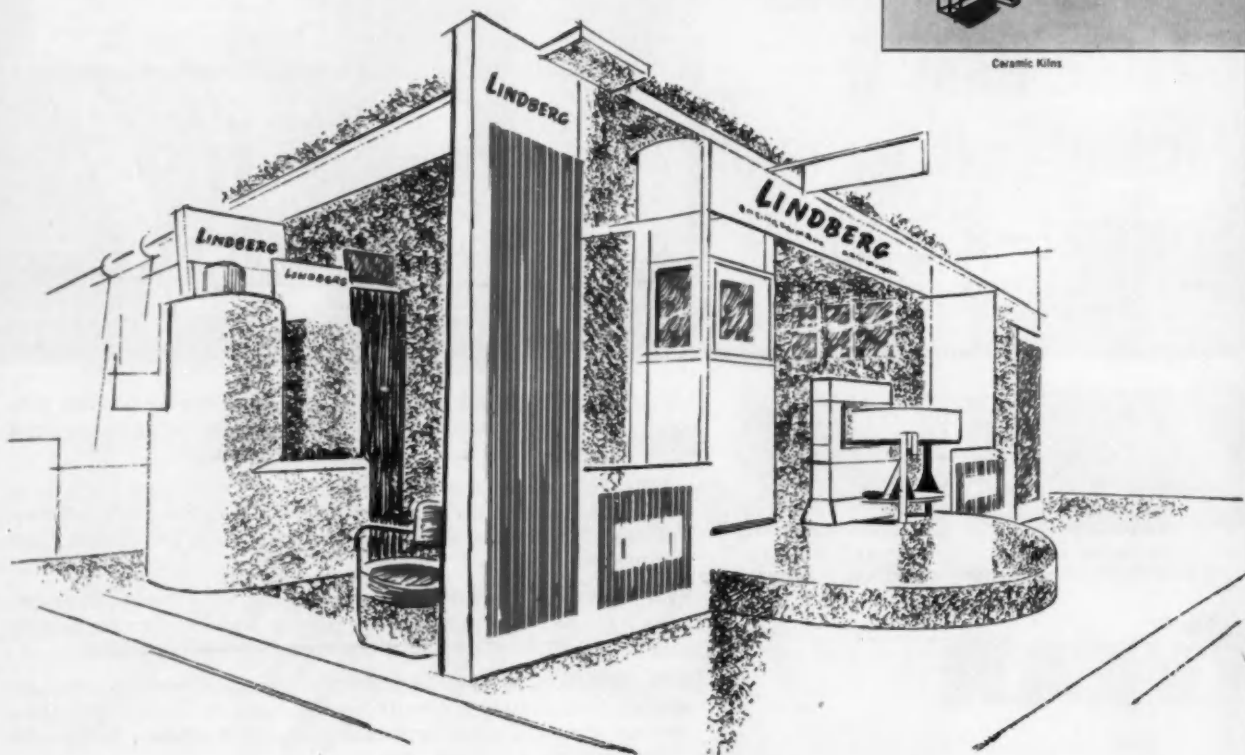
If it has anything to do with the application of heat to Industry...



When you're at the Metal Show in Cleveland, please make it a point to visit headquarters for "Heat For Industry," the Lindberg exhibit in Booth 431. All our top people will be there, engineers, metallurgists, experts in every phase of industrial heat applications. It's quite possible that they can come up with the answer to some of your problems in this field. The latest Lindberg equipment will be shown and, particularly, we'll unveil for the first time a brand-new development in furnaces that we're confident will fill an important place in the heat treating field. Whatever your job may be, if it has anything to do with the application of heat to industry, it's worthwhile talking to Lindberg. So see us at the Show!



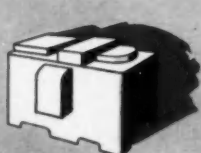
Ceramic Kilns



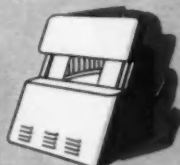
..... BETTER TALK IT OVER WITH *LINDBERG*

The safest way to be sure that you have the right answer for any application of heat to industry is to talk it over with the most widely experienced experts you can find. We believe we have them here at Lindberg. Our business is concerned only with the development of industrial heating equipment and we manufacture the most com-

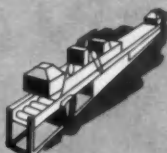
plete line in the field; heat treating furnaces, melting furnaces, high-frequency induction units, ceramic kilns; big ones, small ones, electric or fuel-fired, built in our plant or field-erected. Before you decide on any application of heat to industry, it's reassuring to know you have the right answer. Talk it over with Lindberg.



Melting Furnaces



Laboratory Furnaces



Field-Erected Furnaces



Carbonitriding Furnaces



Induction Heating Units

Here are some specific advantages you get only when you come to Lindberg:

- An organization of experts concentrating only on the development of industrial heating equipment.
- The most complete line of equipment insuring the recommendation of exactly the right methods for your specific product requirements and production processes.
- Research and development laboratories which have originated and perfected many important heating methods and processes. Among these are the Cyclone tempering furnace, automatic control of carbon potential in furnace atmosphere . . . 60 cycle induction melting . . . completely automatic ceramic kilns . . . the "Iron Lung" for treating stainless steel . . . vertical replaceable radiant tubes . . . CORR THERM electric heating elements and many other innovations in the industrial heating field.
- A design committee of the country's top furnace and process engineers which, in cooperation with many of our good customers, has been responsible for such important developments as the high frequency method of heat treating automotive valves, rotary furnaces for forging and annealing titanium, reverberatory furnaces for aluminum and the automatic carbonitriding furnace universally recognized as the leader in the field.
- A world-wide organization of subsidiary companies, making available to Lindberg the latest developments in heat applications in foreign industry.
- A group of technically-trained Field Representatives located in fifteen industrial centers in the United States. There's a trained Lindberg man just as close as your telephone.

You can't afford not to get the best advice possible on your industrial heating problems. We are confident our experience can be helpful to you. Why not talk it over with Lindberg?

LINDBERG ENGINEERING COMPANY

2491 West Hubbard Street, Chicago 12, Illinois

Los Angeles Plant: 11937 S. Regentview Ave., at Downey, Calif.

Associate Companies: Lindberg Industrial Corporation, Chicago • EFCO-Lindberg, Ltd., Montreal, Canada • Lindberg Italiana, Milan, Italy • The Electric Furnace Company, Ltd., Weybridge, Surrey, England • Etablissements Jean Aubé, Paris, France • Lindberg Industrie Ofenbau, Gross Auheim, Germany • Toyo Menka, Tokyo • Lindberg Engineering Company (Australia) Pty. Ltd., Melbourne



**VISION
IN
PRECISION
ENGINEERING**

Creative engineering
has long been identified
with McQuay-Norris.

From this pioneering spirit
have come some notable
achievements: *phosalloy* . . .

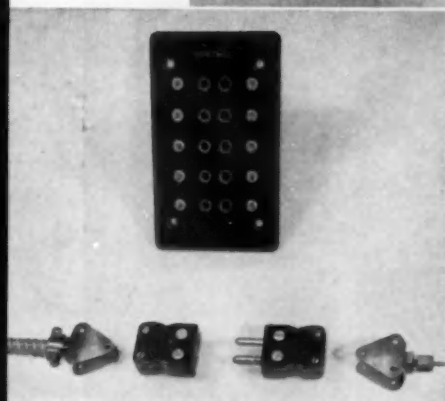
Chrome-Control . . . the 400 oil
ring. If our progressive design
and production facilities can serve
you, we cordially invite your inquiry.

McQUAY-NORRIS

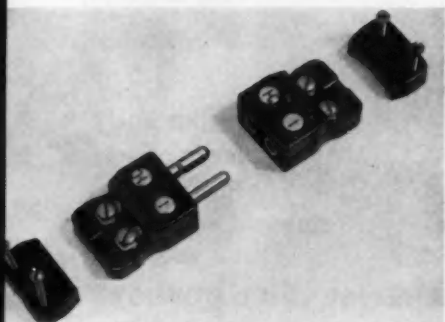
PISTON RINGS . . . HARDENED AND GROUND PARTS

**McQUAY-NORRIS MANUFACTURING COMPANY
ST. LOUIS—TORONTO**

Quik-Konnect jacks and plugs are marked with identification of insert alloy. Plug points are of different diameters for negative and positive poles, to prevent improper connection.



The Quik-Konnect Components consist of (left to right) cable clamp, jack, plug, and tube connector, and (above) jack panel.



Only the terminal cover at the rear of the connector need be removed during connection of wires.

Honeywell's new Quik-Konnect[†] Thermocouple Components cut installation time 75%

... available through your



THERMOCOUPLE connection was never so quick and easy! With Honeywell's new Quik-Konnect Components you can make single, multiple or selective manual connection of a group of couples to an instrument. No handling of small parts. No confusing snarls of loose wire. Installation and assembly time is cut 75%.

Quik-Konnect Components consist of Fiberglas* filled phenolic plastic plugs, jacks and multiple jack panels with tube connectors and cable clamps for mounting. All assemblies are integral units. You can use these assemblies for quick extension wire connections in a laboratory or test cell, or for convenience and certainty of proper connections in permanent or semi-permanent installations.

Plug and jack assemblies are equipped with inserts or points made from the thermocouple alloys to which they should be connected, and are marked with identification of the thermocouple with which they are to be used. Jack panels, each with five jacks, can be used to connect a number of thermocouples to an instrument, or to group connections at a central location. Panels can be mounted in a control board or conduit box. For complete details, call your nearby HSM (Honeywell Supplies Man). He's as near as your phone; or write for S005-1 specification sheet.

MINNEAPOLIS-HONEYWELL REGULATOR CO., Industrial Division, Wayne and Windrim Avenues, Philadelphia 44, Pa.—in Canada, Toronto 17, Ontario.

[†]Trade name of Minneapolis-Honeywell Regulator Co.
^{*}Trade mark Owens-Corning Fiberglas Corp.



MINNEAPOLIS
Honeywell
BROWN INSTRUMENTS

First in Controls

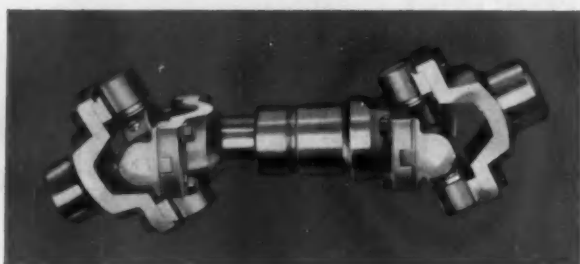
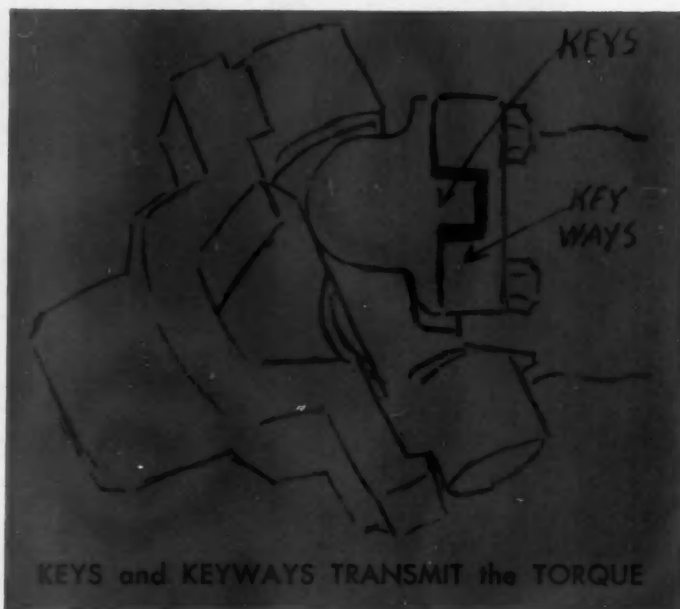
SPECIFY
KEY-DRIVE
JOINTS FOR

SAFE

LESS WEIGHT
TORQUE
TRANSMISSION

M ECHANICS Roller Bearing UNIVERSAL JOINTS increase the Safety factor in power transmission lines, because heavy, machined KEYS and corresponding keyways, not bolts nor screws, transmit the torque. The only function of the cap screws is to hold the bearing assemblies in place.

This KEY method of driving has the highest safety factor, transmits the most torque with the least weight, and avoids costly breakdowns resulting from driving through bolts or screws that work loose.



Let our engineers show you how this and several other MECHANICS Roller Bearing UNIVERSAL JOINT advantages will benefit your new and improved products.

MECHANICS UNIVERSAL JOINT DIVISION
Borg-Warner • 2024 Harrison Ave., Rockford, Ill.

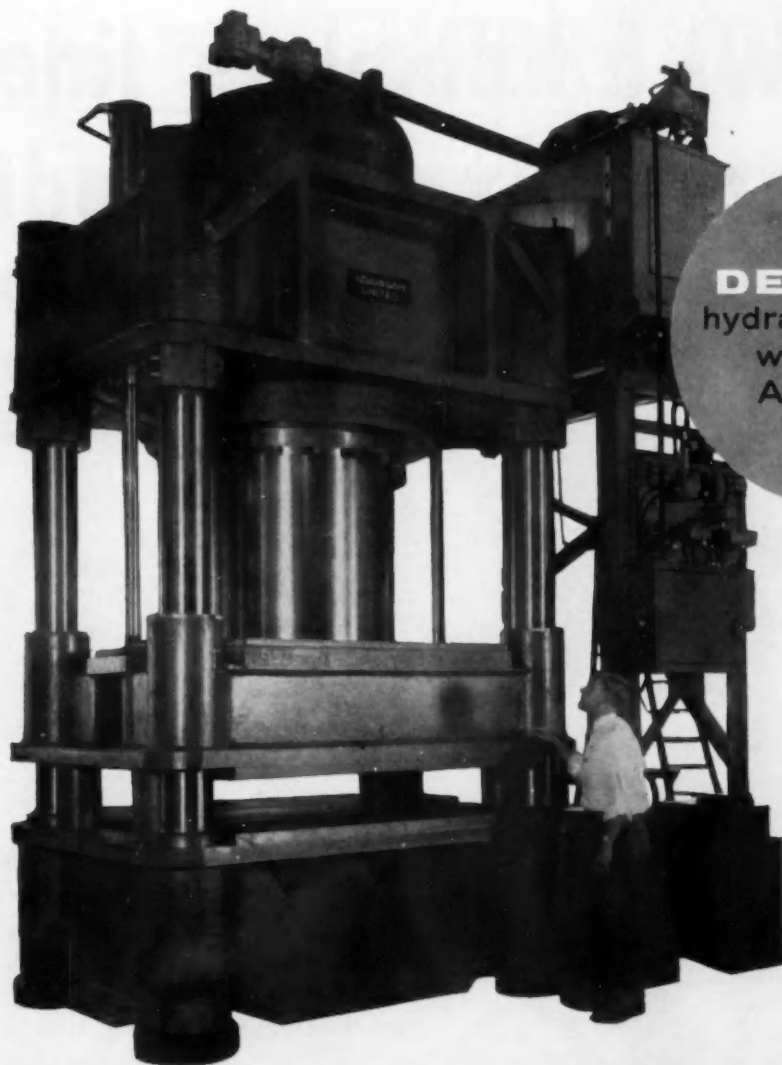
Export Sales: Borg-Warner International
36 So. Wabash, Chicago 3, Illinois

MECHANICS

Roller Bearing

UNIVERSAL JOINTS

For Cars • Trucks • Tractors • Farm Implements • Road Machinery •
Aircraft • Tanks • Busses and Industrial Equipment



How
DENISON
hydraulic power
works for
Adamson
United

Precision control for a metal monster



Denison variable volume axial piston type pump with pressure compensating control, key to this hydraulic system for Adamson United Press.

● To Denison Engineering went the task of designing accurate, foolproof control equipment for this huge compacting press built by Adamson United, Akron, Ohio. Covering more than 40 square feet of platen area, the press has a 40-inch ram designed to operate on a 2300 psi hydraulic system.

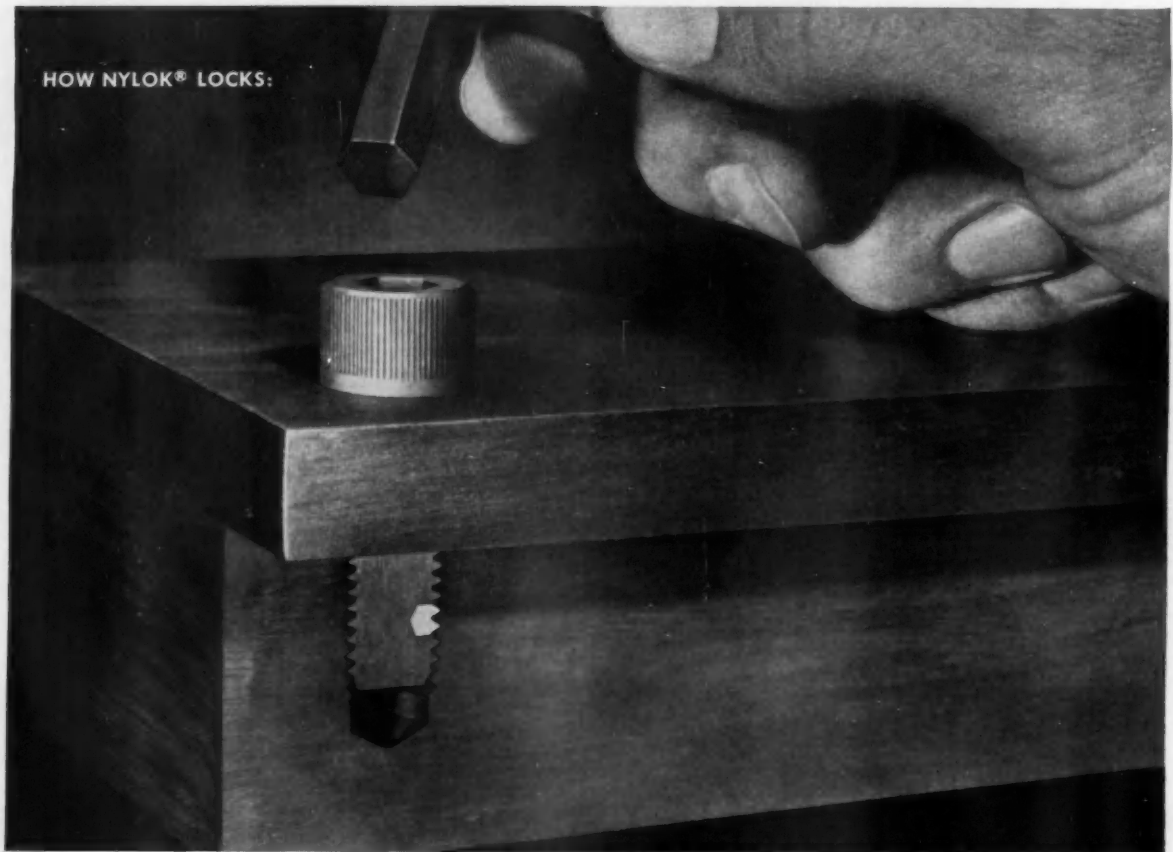
The control system developed by Denison employs a variable-volume axial-piston pump driven by a 15 h.p. motor. A manifold-type hydraulic panel completes the system.

Engineering consulting service like this is available to you at all times to save your design time and assure dependable, efficient performance of your hydraulic circuits. Write us. Denison Engineering Division, American Brake Shoe Co., 1212 Dublin Road, Columbus 16, Ohio.

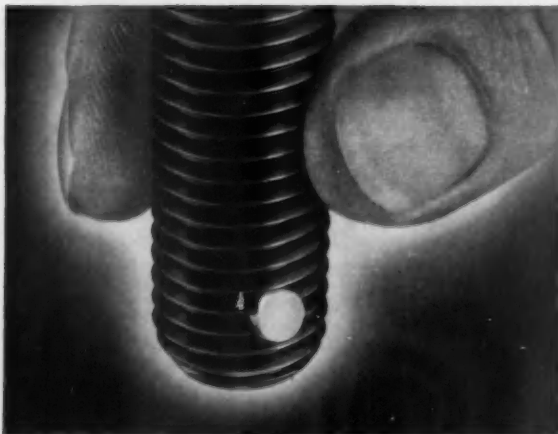
HYDRAULIC PRESSES • PUMPS • MOTORS • CONTROLS



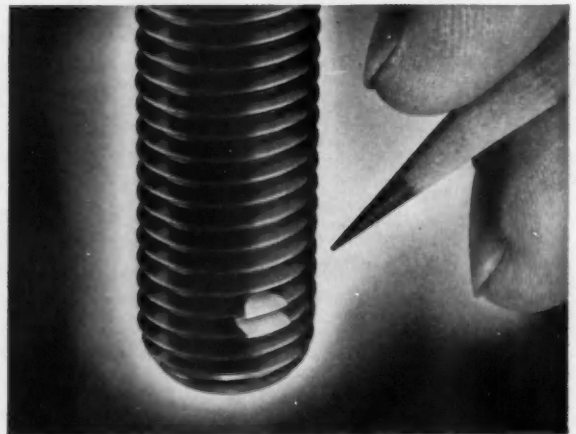
NEW—a complete line of socket screw products



LOCKED! The tough, resilient nylon pellet keys itself into the mating threads. It forces threads together, and locks the screw securely.



BEFORE ASSEMBLY. The nylon pellet projects slightly beyond male threads. When assembled, female threads will be impressed into it. Pellet locks effectively whether the screw is seated or not.



AFTER REMOVAL. "Plastic memory" of pellet has expanded impressed threads to greater diameter than screw threads. Screw can be used repeatedly. In use, "memory" keeps threads tightly locked.

self-locking UNBRAKO that won't work loose

**They simplify design and
save production time**

UNBRAKO socket screws are now available embodying the Nylok® self-locking principle. Nylok provides a truly practical new solution to the problem of making screws self-locking.

An UNBRAKO screw with Nylok is a single self-locking unit. No auxiliary locking devices are needed. Just thread the UNBRAKO into any tapped hole. *Seated or not*, it locks positively wherever wrenching stops. The tough, resilient nylon pellet forces mating threads together and holds tight. The screw will not shake loose.

You save production time when you build products with self-locking UNBRAKOS. And you get greater simplicity in design with less bulk and weight. The number of parts you must assemble to achieve full locking action is reduced to the absolute minimum. Lock-washers under screw heads are no longer necessary. Costly wiring of cross drilled heads is eliminated. So are cotter pins and complex multiple set screw installations.

Self-locking UNBRAKOS are completely reusable. They have uniform locking and installation torques—with no galling or seizing on mating threads. They successfully withstand temperatures from -70° to 250° F. And, on properly seated screws, the pellet acts as a liquid seal.

Self-locking UNBRAKO socket screws come in a complete range of standard sizes and materials. See your authorized industrial distributor. Technical data and specifications are detailed in Bulletin 2193. Write us for your copy today. Unbrako Socket Screw Division, STANDARD PRESSED STEEL CO., Jenkintown 53, Pa.

*T.M. Reg. U.S. Pat. Off., The Nylok Corporation

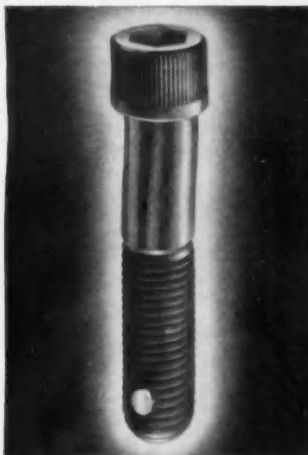
UNBRAKO SOCKET SCREW DIVISION

STANDARD PRESSED STEEL CO.

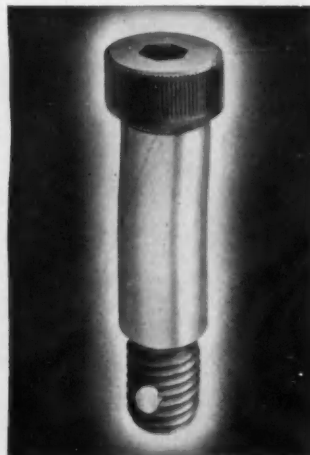
SPS

JENKINTOWN PENNSYLVANIA

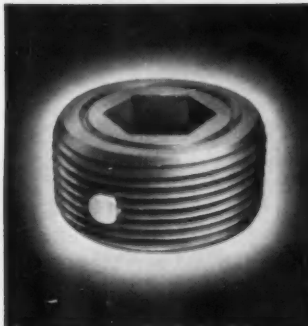
AUTOMOTIVE INDUSTRIES, October 1, 1956



Socket head cap screws. Standard sizes # 6 to 1 in.



Socket shoulder screws. Standard sizes $\frac{1}{4}$ to $\frac{3}{4}$ in.



Socket pressure plugs. Standard sizes $\frac{1}{8}$ to $1\frac{1}{4}$ in.



Socket set screws. All standard point types. Standard sizes # 6 to 1 in.



Flat head socket screws. Standard sizes # 6 to $\frac{3}{4}$ in.



Button head socket screws. Standard sizes # 6 to $\frac{3}{4}$ in.

NOW AVAILABLE for automotive applications



R/M FLEXIBLE THIN-WALL Teflon[®] TUBING

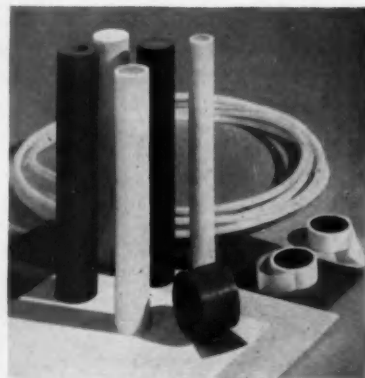
Working with "Teflon" requires knowledge and skills that only experience can provide. Raybestos-Manhattan's research and testing laboratories have been actively engaged in developing the vast potentials of this remarkable material ever since it first became available.

Now, out of these laboratories comes R/M Flexible Thin-Wall "Teflon" Tubing—stainless steel wire braided or rubber covered—for automotive applications, particularly the cooling of oil in automatic transmissions. This new tubing has great flexi-

bility and does not expand, contract or fatigue. It also has great resistance to high temperatures and corrosive lubricants. Available through leading coupling manufacturers. List of suppliers and complete specifications furnished on request.

Other R/M "Teflon" products for the automotive industry include rods, sheets, tubes and tape; centerless ground rods held to very close tolerances; stress-relieved molded rods and tubes; Raylon—a mechanical grade of "Teflon" with many of the characteristics and properties of virgin "Teflon." For details, call or write R/M.

*Du Pont trademark



RAYBESTOS-MANHATTAN, INC.

PLASTIC PRODUCTS DIVISION, MANHEIM, PA.

FACTORIES: Bridgeport, Conn.; Manheim, Pa.; No. Charleston, S.C.; Passaic, N.J.; Neenah, Wis.; Crawfordsville, Ind.; Peterborough, Ontario, Canada

RAYBESTOS-MANHATTAN, INC., Engineered Plastic, Industrial Rubber, and Sintered Metal Products • Packings • Asbestos Textiles • Abrasive and Diamond Wheels
Rubber Covered Equipment • Brake Linings • Brake Blocks • Clutch Facings • Fan Belts • Radiator Hose • Laundry Pads and Covers • Bowling Balls

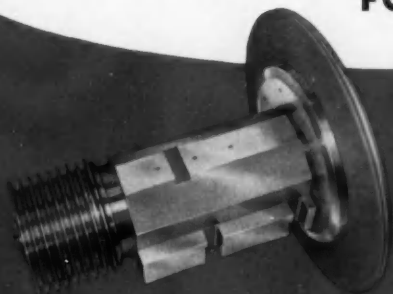
There's an EX-CELL-O

Precision Spindle

**BUILT ESPECIALLY
FOR YOUR WORK**



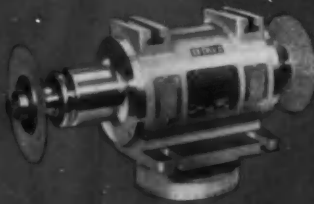
Single-body, belt-driven internal grinding spindle.



25 hp heavy duty precision spindle with 24" grinding wheel.



25,000 rpm high frequency inbuilt motor spindle.

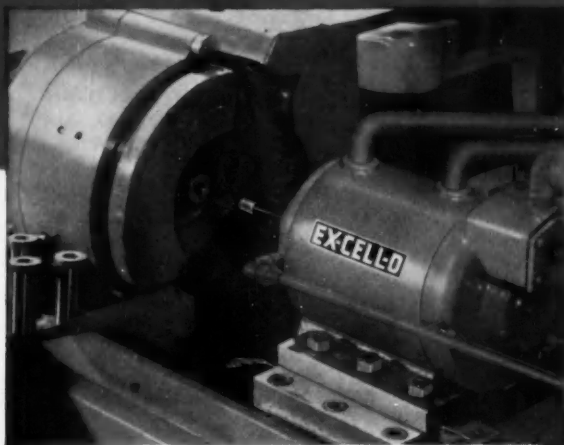


Precision inbuilt motor spindle for cutter grinder.



Totally enclosed inbuilt motor surface grinder spindle.

Heavy duty motorized precision spindle available up to 20 hp.



EX-CELL-O High-frequency Spindle, rated at 40,000 rpm, grinds small holes in bushings.



For production grinding to precision limits "just any spindle" won't do. It must be carefully selected to suit the work. From Ex-Cell-O's widely-varied line of precision spindles you can select a standard model, or we'll make one special to your requirements. These spindles have long been the original equipment choice of leading manufacturers.

Features of the line include:

Rigidity
Permanent adjustment
No vibration, no chatter
Precision ball bearings preloaded for predetermined speeds

Phone your Ex-Cell-O representative, or phone or write Ex-Cell-O in Detroit, for CATALOG LISTING HUNDREDS OF STANDARD GRINDING SPINDLES

MANUFACTURERS OF PRECISION MACHINE TOOLS • GRINDING SPINDLES • CUTTING TOOLS • RAILROAD PINS AND BUSHINGS
DRILL JIG BUSHINGS • AIRCRAFT AND MISCELLANEOUS PRODUCTION PARTS • DAIRY EQUIPMENT

EX-CELL-O
CORPORATION
DETROIT 32, MICHIGAN



There is NO SUBSTITUTE for a forging: NO SUBSTITUTE for Wyman-Gordon Experience

There is more to the superiority of the forged crankshaft than just strength.

No other method of fabrication can compare with the forging process for dependability. The uniformity and predictability of physical properties with minimum variance from piece to piece or from one location to another in the same piece is assured to the greatest degree by modern forging practice.

Top automotive engineers agree that the use of a forged crankshaft permits the design of a more compact engine which is

a decided advantage when thinking in terms of limited space available and overall engine weight reduction.

As compression ratios increase and engine outputs go up the risk factor must be reduced. Again, the uniformity of quality in the backbone of the engine, the crankshaft, is most essential and made possible only by a forging.

There is NO SUBSTITUTE for a forging and in a forging there is NO SUBSTITUTE for WYMAN-GORDON quality and experience.

WYMAN-GORDON COMPANY

Established 1883

FORGINGS OF ALUMINUM • MAGNESIUM • STEEL • TITANIUM
WORCESTER 1, MASSACHUSETTS
HARVEY, ILLINOIS • DETROIT, MICHIGAN

DURABILITY?



**silicone
rubber
defies
aging,
ozone,
weathering**

Looking for rubber with *unusual durability*? General Electric silicone rubber offers exceptional resistance to aging, ozone and weathering. For example, it provides *virtually ageless* insulation for transformers and turbine generators. It makes aircraft seals which are *unaffected by weather or by ozone concentrations* at high altitudes. If *durability* is what you need in rubber parts, specify General Electric silicone rubber!

Where can YOU use G-E silicone rubber?

There's a kind for almost every requirement, classified according to dominant property for easy selection and specification. For example: Class 300 offers the best recovery after compression of *any known rubber*! Class 700 provides serviceability at temperatures up to 600 F! Which class is best for you?

For more details on G-E silicone rubber, see your "Sweet's Product Design File."



Send today for a NEW, REVISED
"LIGHTNING SELECTOR"!

Progress Is Our Most Important Product

GENERAL  ELECTRIC

G-E silicone rubber provides...

Outstanding
resistance to
extreme
temperatures



Superior
resistance to
compression
set



Dielectric
strength
stable at high
temperatures



Unequalled
resistance to
aging, ozone,
weathering



**SILICONE PRODUCTS DEPARTMENT
GENERAL ELECTRIC COMPANY**

**Section 61-5C
WATERFORD, NEW YORK**

Please send me, at no obligation, technical data on G-E silicone rubber, including a newly revised "Lightning Selector" and up-to-date list of fabricators

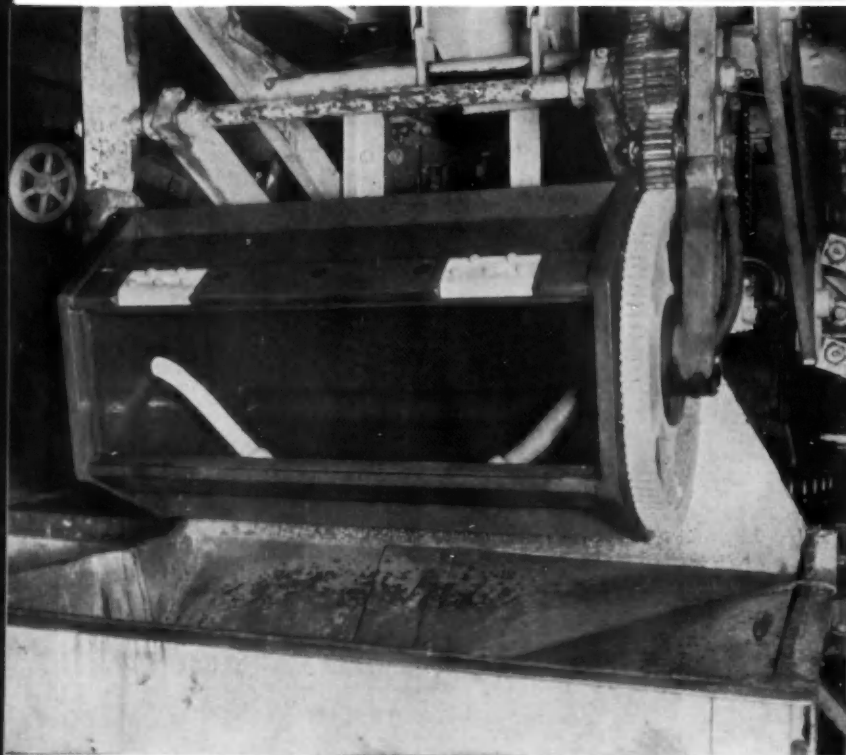
Name _____ Position _____

Firm _____

Street _____

City _____ Zone _____ State _____

IN CANADA: MAIL TO CANADIAN GENERAL ELECTRIC COMPANY, LTD., TORONTO



THE BEST BARREL CYLINDER EVER MADE

**After 13 Months Of Three-Shift Usage This
Udylite Tempron Cylinder Shows Little Wear**

This unretouched photograph shows a Udylite Tempron Barrel Cylinder which has been in use for thirteen months, most of the time in a "round the clock" operation. This cylinder looks like new.

Seams are tight and there is no warping although it has processed thousands of heavy loads of work through a complete cycle of *electro-clean, acid pickle, zinc plate, bright dip or dichromate* and hot and cold rinses. Most of these loads have been beyond our guarantee of 200 pounds per 14" x 30" cylinder.

In January, 1955 and after two years of exhaustive tests, Udylite formally introduced the Tempron Barrel Cylinder as the most efficient and long lived plating barrel ever offered. The vitality of Tempron and the durability of Udylite construction has now been convincingly proven in hundreds of operations.

During a recent twelve month period, a set of Udylite Tempron Barrel Cylinders has processed millions of pounds of work, mostly through the complete zinc cycle. Any measurement of wear is almost impossible.

Udylite Tempron Cylinders withstand, even under load, the highest temperatures used in plating. Withstand stronger acids. Have greater resistance to abrasion and can be used through the entire plating cycle.

Let us tell you more of the advantages of Udylite Tempron Cylinders or show you "on the job" examples. Write us today.

THE
Udylite

CORPORATION
DETROIT 11, MICHIGAN

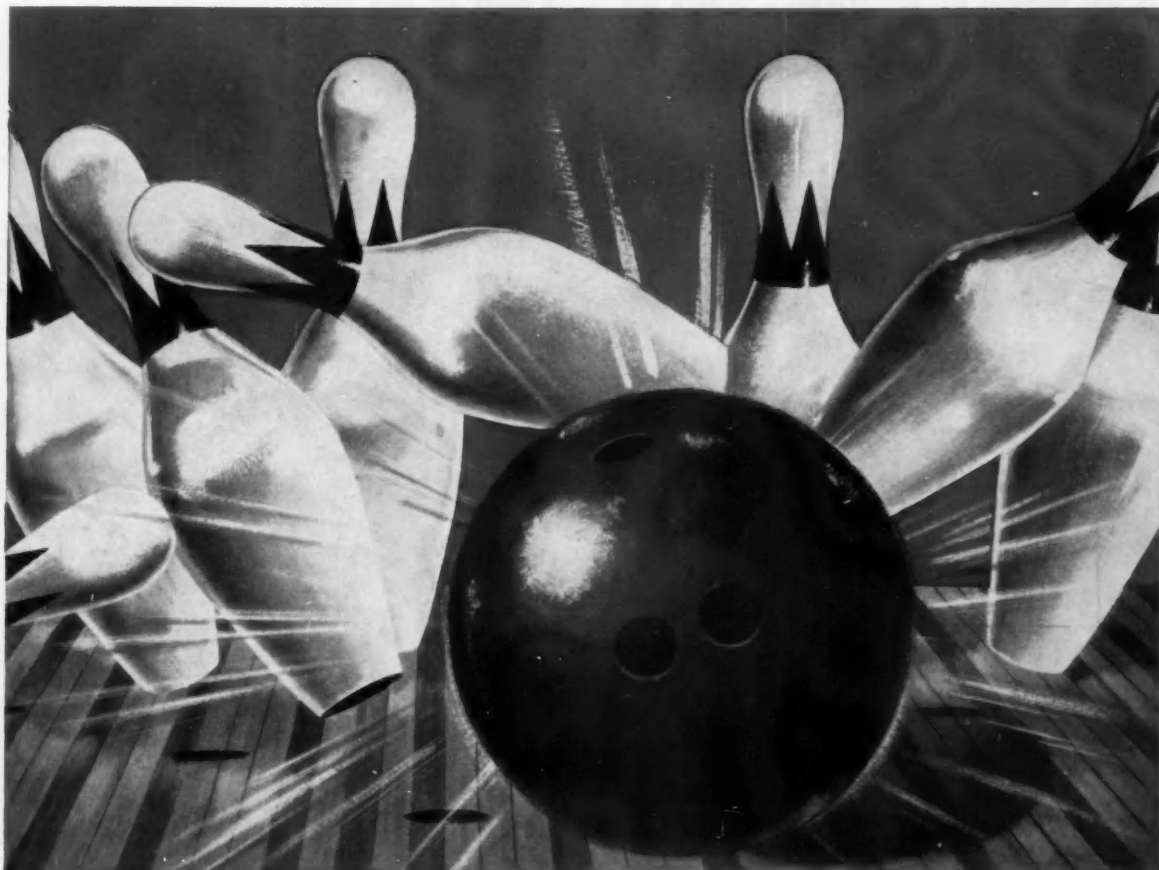
WORLD'S LARGEST
PLATING SUPPLIER

CALENDAR

OF COMING SHOWS AND MEETINGS

- AIEE Fall General Meeting, Morrison Hotel, Chicago, Ill. Oct. 1-5
- Air Moving and Conditioning Association, annual meeting, Greenbrier, White Sulphur Springs, Va. Oct. 2-4
- Standards Engineers Society, Hotel Willard, Washington, D. C. Oct. 3-5
- SAE National Aeronautic Meeting, Production Forum, and Engineering Display, Hotel Statler, Los Angeles, Calif. Oct. 2-6
- Paris Automobile Show, France. Oct. 4-14
- ASME - ASLE Third Lubrication Conference, Chalfonte-Haddon Hall, Atlantic City, N. J. Oct. 8-10
- National Metal Exposition, Public Auditorium, Cleveland, O. Oct. 8-13
- Second Joint Military - Industry Packaging and Materials Handling Symposium, Wash., D. C. Oct. 9-12
- Material Handling Institute, fall meeting, Traymore Hotel, Atlantic City, N. J. Oct. 10-11
- SAE National Transportation Meeting, Hotel New Yorker, New York, N. Y. Oct. 10-13
- National Defense Transportation Association, convention and transportation forum, Salt Lake City, Utah Oct. 14-17
- National Industrial Conservation Conference, Phoenix, Ariz. Oct. 15-16
- American Society of Body Engineers, annual convention, Rackham Bldg., Detroit, Mich. Oct. 17-19
- International Motor Show, Earls Court, London, England. Oct. 17-27
- National Conference on Industrial Hydraulics, Sherman Hotel, Chicago, Ill. Oct. 18-19
- SIPMHE Protective Packaging and Material Handling Exposition, Public Auditorium, St. Louis, Mo. Oct. 21-24
- National Industrial Exposition & Management Conferences, Artillery Armory, Detroit, Mich. Oct. 22-26
- National Safety Congress and Exposition, Chicago, Ill. Oct. 22-26
- ASME-AIME Joint Fuels Conference, Sheraton-Park Hotel, Washington, D. C. Oct. 24-25
- AMA Special Manufacturing Conference, Hotel Roosevelt, New York, N. Y. Oct. 24-26
- Gray Iron Founders' Society, annual meeting, Homestead, Hot Springs, Va. Oct. 31-Nov. 2
- AMA Special Conference on Mergers and Acquisitions, Hotel Roosevelt, New York, N. Y. Oct. 31-Nov. 2
- SAE National Diesel Engine Meeting, Drake Hotel, Chicago, Ill. Nov. 1-2
- National Tool & Die Manufacturers Association Convention, Statler Hotel, Hartford, Conn. Nov. 1-4
- SAE National Fuels and Lubricants Meeting, Mayo Hotel, Tulsa, Okla. Nov. 8-9
- International Autorama Exposition, Commercial Museum, Phila., Pa. Nov. 10-17
- Cycle and Motorcycle Show, London, England. Nov. 10-17
- National Industrial Development Exposition, Coliseum, New York, N. Y. Nov. 12-16
- ASME Annual Meeting, Hotel Statler, New York, N. Y. Nov. 25-30
- Third International Automation Exposition, New York Trade Show Building, New York, N. Y. Nov. 26-30
- National Automobile Show, Coliseum, New York, N. Y. Dec. 8-16

DEPENDABILITY



"Finish first in your league"

...with J&L 1200 COLD FINISHED STEELS

When your machining applications require a steel that's tops in quality, machinability, uniformity and surface finish—"J&L 1200" Cold Finished Steel is the answer. It's one of a complete line of premium quality, free-machining bar steels developed over the years by J&L specialists. Thus, we can recommend the right type to help solve your problems.

Operators in shop after shop around the country using "J&L 1200" report:

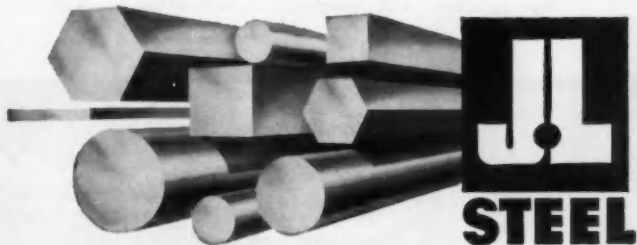
- Better machine finishes
- Improved tool life
- Increased machining speeds
- Greater uniformity

"J&L 1200" grades, available in all standard shapes and sizes, meet the compositions published by the American Iron & Steel Institute (AISI C-1213) . . . Society of Automotive Engineers (SAE 1113) . . . and Federal Specification QQS-633.

Use this steel in your own shop to secure better work at lower over-all costs. Results will convince you "J&L 1200" deserves to be a regular specification for your production runs.

Adequate stocks of all J&L cold finished free-machining steels are available in important industrial centers. Phone the nearest J&L District Office or your Distributor today for prompt and efficient service.

Pick the Free-Machining Steel that serves you best—from J&L's complete Cold Finished Line



Jones & Laughlin

STEEL CORPORATION • PITTSBURGH

COLD FINISHING PLANTS AT
PITTSBURGH, PA., AND HAMMOND, IND.

DEPENDABILITY



A reliable source for dependable products

Perhaps no measurement of value is as important as dependability. For, obviously, in automotive components, sound design, outstanding performance, and efficient production service can only stem from an organization built on the solid foundation of dependability.

For over thirty years Bendix Products Division has demonstrated its ability not only to meet, but to anticipate the needs of the automotive industry. The fact that

Bendix products have won such wide acceptance is proof of dependability.

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Bendix Power Brakes*



Bendix Power Steering*



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BUSINESS DEPARTMENT

John C. Hildreth, Jr., Publisher
John F. Pfeffer, Asst. to Publisher
E. H. Miller, Advertising Mgr.
E. W. Havner, Circulation Mgr.
John R. Flood, Market Research
 Chestnut and 56th Sts.
 Philadelphia 39, Pa.
 Phone SHerwood 8-2000

REGIONAL MANAGERS

CHICAGO—**John T. Hoole**
 —**William H. Baldwin**
 360 North Michigan Ave.
 Chicago 1, Ill.
 Phone FRanklin 2-4243

DETROIT—**Melvin B. Nylund**
 1015 Stephenson Bldg.
 Detroit 2, Mich.
 Phone TRinity 5-2090

PHILADELPHIA and NEW YORK—
Nelson W. Sieber
 Chestnut and 56th Sts.
 Philadelphia 39, Pa.
 Phone SHerwood 8-2000
 and
 100 East 42nd St.
 New York 17, N. Y.
 Phone OXford 7-3400

CLEVELAND—**Richard P. Keino**
 930 B. F. Keith Bldg.
 Euclid Ave. and East 17th St.
 Cleveland 15, Ohio
 Phone SUperior 1-2860

DALLAS—**Gordon A. Brauning**
 8557 Eustis St.
 Dallas 18, Texas
 Phone DAvis 7-4176

SAN FRANCISCO—
R. J. Birch and **Frank W. McKenzie**
 300 Montgomery St.
 San Francisco 4, Calif.
 Phone DOuglas 2-4393

LOS ANGELES—**L. H. Jackson**
 4055 Wilshire Blvd.
 Los Angeles 5, Calif.
 Phone DUmkirk 7-2119

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High Spots of This Issue

★ Ford Offers Trio of Sizes for '57 With Many Changes

Numerous chassis improvements, several power plant options, and new styling features characterize the Ford line-up for 1957. A total of 19 models in the Fairlane, Custom, and Station Wagon series fit any buyer's taste. Page 50.

★ Fuel Factors Influencing Intake Deposition

The problem of minimizing induction system deposition is an age-old one with the refining industry. The story of how deposit-forming properties of gasoline have come to be controlled, as related here, is good reading. Page 54.

★ High-Thrust Jets and Rockets at Farnborough Air Show

Over 6000 foreign visitors from some 120 countries were on hand for this year's British aerial exposition. Paraded for their benefit were the products of some 338 British manufacturers, including several new items. Page 60.

★ Bendix Aircraft Ignition Conference

Due to the growing usage of gas-turbine-equipped aircraft, interest is keen in jet engine ignition systems. The Bendix Aircraft Ignition Conference in Sidney, N. Y., was a sounding board for the latest developments. Page 66.

★ Preview of the Metal Show for 1956

When the doors to Cleveland's huge Public Auditorium open on Oct. 8, the 38th National Metal Exposition will be underway. A record 465 exhibitors will display a wealth of products in the 250,000 sq ft of floor space. Page 74.

★ 52 New Product Items And Other High Spots, Such As:

Chrysler Corp. cars for '57; Bendix fuel injection system; shuttle piston fuel injection system; Holley carburetors; Continental for 1957; SAE tractor meeting; skin milling machine; grinding machines in transmission plant; shielded spark plugs; and what's new at the National Metal Show.

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Automotive and Aviation News, Page 33

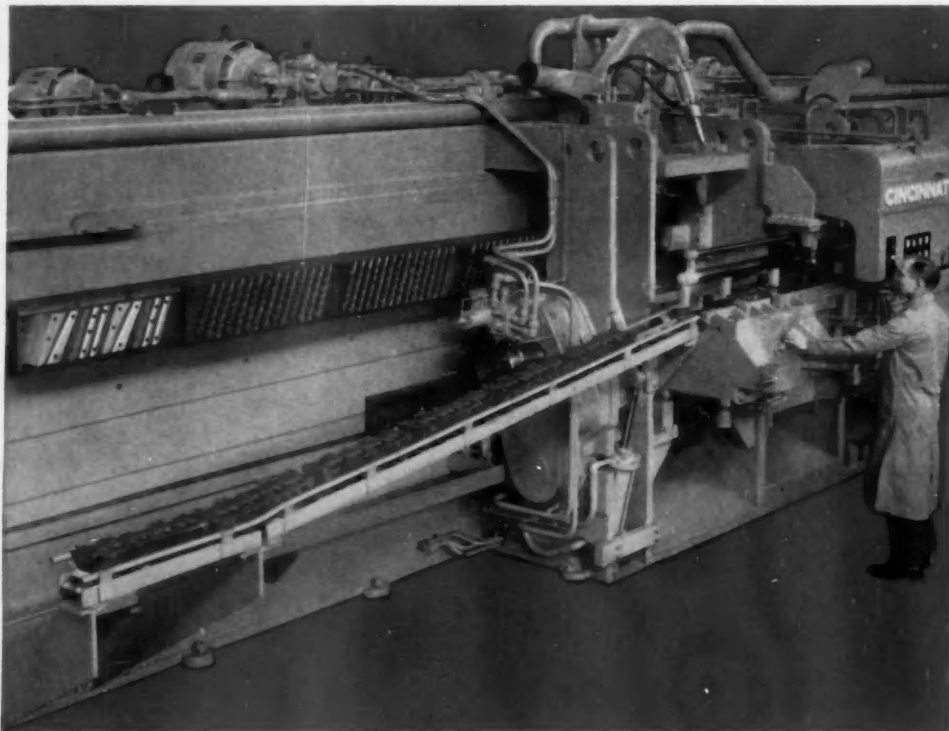
AUTOMOTIVE INDUSTRIES COVERS:
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BROACH

Double - Action Cincinnati

BROACH

Broaches 150 Cylinder Heads per Hour



Within the past few years spectacular progress has been made in the design and cost-reducing potential of machine tools. For example, consider the cost savings now possible in the machining of cylinder blocks and heads.

Today, CINCINNATI Horizontal High Speed Surface Broaching Machines are producing $2\frac{1}{2}$ times faster than comparable equipment a few years old, and tool life per unit has increased 25 times!

While these cost savings are more spectacular than might be realized in the production of smaller parts, they are indicative of the big strides made by Cincinnati Milling in reducing costs through the application of modern broaching techniques. Remember this: Cincinnati's broaching experience dates back more than 20 years . . . Cincinnati was first in developing many present-day broaching concepts such as electro-mechanical drive . . . Cincinnati builds a complete line of horizontal and vertical broaching machines, including large special broaches built to your specifications. Would you like to have a picture-book review and brief specifications of CINCINNATI Horizontal Broaching Machines? Write for catalog No. M-1910.

PRODUCTION DATA

Surfaces broached	top, joint, intake and exhaust faces
Cutting speed	150 feet per minute
Stock removal	$3/16"$ ($1\frac{1}{2}$ ton per hour)
Production	150 heads per hour



CINCINNATI 22-foot stroke, Two-Way Horizontal Broaching Machine, tooled up and conveyerized to broach cylinder heads.

THE CINCINNATI MILLING MACHINE CO., CINCINNATI 9, OHIO



CINCINNATI

MILLING MACHINES • CUTTER SHARPENING MACHINES • BROACHING MACHINES
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News of the AUTOMOTIVE AND AVIATION INDUSTRIES

Vol. 115, No. 7

October 1, 1956

Yale & Towne Building New West Coast Plant

A \$1 million plant for production of lift trucks is being constructed by Yale & Towne Manufacturing Co. in San Leandro, Calif., to serve the Pacific Coast market. The 100,000 sq ft plant is scheduled for completion early in 1957. It will employ about 400 persons when in full production.

Chevrolet To Move Transmission Output From Toledo To Muncie

The acquisition by Chevrolet of new plants for production of automatic transmissions has necessitated the realignment of certain present facilities for the manufacture of standard transmissions. Plans are now under way to move final assembly of all standard truck transmissions from the company's Central Ave. plant in Toledo to its plant in Muncie, Ind., which also has been producing truck transmissions.

Under present plans, the 25,000 sq ft Central Ave. facility will continue to be used for the production of smaller parts for truck transmissions and several passenger car components. Many of the workers who will be laid off at the Central Ave. plant will be absorbed at the company's new automatic transmission plant in Toledo, scheduled to go into production in October.

Buick To Start Output Of '57 Models Oct. 15

Buick starts production of its 1957 models on Oct. 15. The company's assembly lines have been down since Sept. 19, when the last 1956 model was produced; the new models go on public display Nov. 9.

Buick's production of 572,024 cars for the 1956 model year was the third best in history. Two-door and four-door hardtops accounted for nearly 70 per cent of the total.

AIRPORT AID

Freight-lifting Karrier Gamecock truck, designed for rapid loading and unloading of aircraft, is now used by Pan American at London airport. Scissor cross-members are driven by two hydraulic rams and raise the alloy body to a maximum height of 10 ft. 4 in. When the truck is in position, the head-board drops forward to extend the floor.



Mack Trucks Acquires Ohio Bus Manufacturer

Mack Trucks, Inc. has extended its diversification program by acquiring C. D. Beck & Co., Inc., manufacturer of inter-city buses at Sydney, O. The purchase accelerates Mack's program of getting into production of large inter-city coaches to meet an expected increase in demand generated by the new highway program. The Beck firm will be operated as a division of Mack Trucks under present plans.

Ford Retractable Hardtop To Be Offered in '57 Line

Ford early next year will introduce the industry's first retractable hardtop car. Patterned somewhat after an all-steel retractable top brought out by Ford in 1953 on the Syrtis "dream car," the roof can be lowered electrically under the rear deck lid. The roof is made up of two hinged pieces which fold together like a clam shell at the front.

When actuated, the roof tips up and backward, with the two pieces folding and dropping into the luggage compartment on slide rails. The deck lid rises simultaneously to make

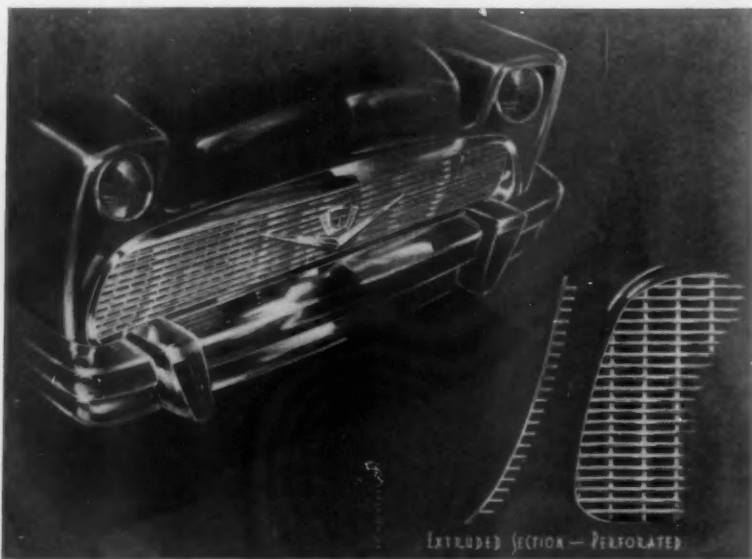
room for the roof as it moves backward. To accommodate the roof, the deck lid has been hinged at the back and bottom.

It takes about a half minute for the entire roof assembly to retract into the luggage compartment. The roof automatically locks into position after it is brought back up. Ford says there is ample space in the trunk for luggage and spare tire when the roof is lowered.

Speaking at a press preview of the 1957 Ford line, at which the new retractable hardtop car was introduced, R. S. McNamara, general manager, Ford Div., estimated that prices of the 1957 models will average about three per cent higher than those on 1956 models. The average wholesale price increase would be about \$53 a car.

Mr. McNamara went on to predict that retail automobile sales in 1957 should total about 6.6 million cars, compared to 5.9 million this year. Ford Div. spent, he said, a record \$209 million to bring out its new line and hopes to attain over a 10 per cent sales increase next year as compared to 1956. It will add some 13,000 workers to the payroll.

News of the AUTOMOTIVE



PRACTICAL TECHNIQUE FOR CAR GRILLE PRODUCTION

Presented here by Reynolds Metals Co. is a new idea for production of perforated-type automobile grilles. Instead of being stamped from sheet metal, aluminum grille sections may be produced by the extrusion process, with integral deep flanges providing the depth effect. Such grilles can be anodized for protection and color versatility.

GM Will Put More Emphasis On "Previews of Progress"

General Motors Corp. is planning to devote more attention to its traveling science show "Previews of Progress." Since its Motorama and Parade of Progress shows have been suspended, at least for the time being, the company is now going all out to promote the Previews of Progress.

The company has decided to double the number of two-man teams which put on the 40-minute show around the country and has added several features. Among them will be demonstrations of the miniature sun-powered automobile, the Sunmobile, which was first displayed at the GM Powerama in Chicago last year. (See AI, Aug. 15, 1955.)

New Trend in Colors Seen for 1957 Cars

The 1957 model automobiles are expected to usher in a new trend in exterior colors which may see a striking comeback of black finishes. This color has been diminishing in popularity since 1950 and many stylists

felt that it would become passé in the not-too-distant future. Two years ago, black represented a very small percentage of the myriads of colors offered but, now that the garish color "splurge" of 1955 and 1956 has run its course, more subtle hues will once again start appearing.

With the appearance of the 1956 models, black made a slight comeback and, surprisingly, became the most popular color on many models by mid-year, either as a solid color or in combination with another hue. Giving way to black will be such once highly popular colors as light green and red. The vogue for white, which hit a new high with 1956 models, apparently will be short-lived. Stylists believe its popularity will taper off gradually and that the off-whites, such as beige-whites, and other softer colors will displace many colors which appeared on 1956 models. In two-tone combinations the trend will be to a less sharp contrast than previously, and many cars will feature two-tones with different shades of the same color.

Functional Modernism Glows In New Ford Office Quarters

"Palatial" is probably the best single word to describe the new ultra-modernistic structure in Dearborn, Mich., which houses the administrative offices of Ford Motor Co. Containing nearly one million sq ft of space, it is one of the country's largest buildings to house offices of a single company.

Three years in the construction stage, the 12-story building has probably one of the most intriguing addresses ever placed over an entrance of an administrative building. The address reads simply "The American Road, Dearborn, Mich."

Some of the outstanding features highlighting the new building: a spacious main lobby with extensive exterior glass walls and French Rouge Antique marble for interior finish, accentuated by a 37 ft pool with set sprays of water; marbles and woods throughout the interior representing several foreign countries; a 500-seat auditorium; 625-seat cafeteria; a three-level garage; and nearly 600 trees scattered throughout the 90-acre grounds surrounding the building. More than 80 original paintings grace the executive offices, and other outstanding art work is found through the building.

AMC Grants Detroit Attorney Option to Buy Hudson Plant

In a further effort to reduce overhead and dispose of surplus facilities for which it has no need, American Motors Corp. has decided to sell its plant on Jefferson Ave. in Detroit, a facility once used as the headquarters of Hudson Motor Car Co. The company has granted a 90-day purchase option for the plant to a Detroit attorney.

Under the agreement, AMC would lease back about one-third of the 2.5 million sq ft plant for its defense operations, which are directed by the Special Products Div. Last December, AMC sold another former Hudson plant located on Detroit's east side; it still retains a third former Hudson facility in the same general area. Purchase price for the Jefferson Ave. facility is \$5 million.

AND AVIATION INDUSTRIES

Report That Studebaker Plans Output of Large Trucks False

Contrary to some reports, Studebaker is not invading the large heavy-duty truck field. The misconception arose from the company's announcement that it is expanding its current line for 1957 to include a 19,000 GVW truck.

It is not, however, planning at present to enter the large heavy unit field. There also is no substance to reports that Studebaker will use Daimler-Benz Diesels in its trucks in the immediate future.

New Enjay Polymer Laboratory Features Latest in Facilities

Enjay Co., Inc., a leading marketer of petrochemicals, unveiled its new Polymer Laboratory at Linden, N. J., on Sept. 18. Doubling the size of the company's technical service facilities at Linden, the facility is equipped with the newest and most advanced equipment in the field of rubber technology.

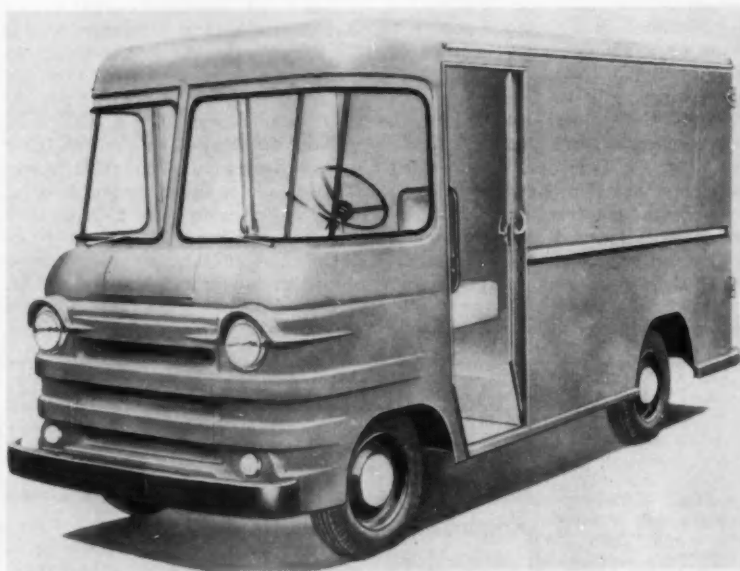
Most of the laboratory's program will be devoted to applications-research work on Butyl rubber. Butyl has been marketed by Enjay since the spring of 1955.

The laboratory has 24 major pieces of equipment, plus another score of testing devices. In one testing apparatus—an ozone chamber—Enjay researchers not only can duplicate atmospheric conditions to be found anywhere in the world; they can exaggerate them as desired for testing purposes.

The laboratory is also equipped with a large variety of molds and presses, extruders, mills, mixers, calenders, vulcanizers, tensile testers, electrical testers and flexometers.

Twin Disc Clutch Co. Dedicates New Modernistic Plant at Racine

Coincidental with its 38th anniversary, Twin Disk Clutch Co. formally dedicated its new plant at Racine, Wis., on Sept. 12. The first unit of the plant will provide 92,500 sq ft of additional floor space. The \$2 million structure will be used for expanded production of models now turned out



DELIVERY BODY MADE OF MAGNESIUM AND PLASTIC

Latest addition to the Boyertown line of Merchandiser delivery bodies is this lightweight unit with a body featuring a special Dow magnesium alloy and a cab made up of molded parts of plastic reinforced with glass fibers by Lunn Laminates. Designed for all types of truck chassis, the forward-control delivery body has a capacity of 365 cu ft and is being built in 10 and 12-ft loadspace lengths.

in the original Racine plant and at the Hydraulic Div. in Rockford, Ill.

Designed with an eye toward even further expansion in the future, the plant layout is such that the building can be expanded at least five times.

Location of the plant, on a 22-acre tract, is adjacent to the St. Paul railway tracks, to provide excellent shipping and receiving facilities.

Ferguson Car Output Awaiting Maker Willing to Risk Venture

Reports from reliable sources in Britain indicate that the Ferguson car design has now been perfected. Full-scale production is so far being balked, however, for lack of a large British manufacturer prepared to take the risk.

Several prototypes are ready, and impartial experts who have put them through exhaustive tests claim that adhesion on all kinds of surfaces, steering, braking, comfort and general performance are excellent.

The Ferguson vehicle is described as a unique combination of advanced

chassis features. Some entirely new departures in construction, braking, transmission and drives are included, although no technical details have been disclosed.

General features are believed to comprise all-independent suspension, four-wheel drive with a common transmission brake, and a rear-mounted engine coupled through a torque converter and automatic gearbox. The transmission system includes no unorthodox hydraulics.

Harry Ferguson states that improved traction leading to greater safety is the keynote of his project. He maintains that "the correct course is to prevent crashes by sound and safe chassis design and not just to try to cushion people against the results of accidents". This he claims to have achieved, together with comfort, light weight, and low cost.

Yet he is convinced that the first basic essential of a commercially competitive vehicle is not price, but performance. Mr. Ferguson still hopes that a British manufacturer will undertake mass production, and it

News of the AUTOMOTIVE

is understood that financial support would be available and even that a sales program has already been worked out.

Partial success in this field has been reached. It is believed that Standard Motor Co. (which makes the Ferguson tractor) is preparing to introduce Ferguson's transmission in its 127 cu. in. Vanguard sedan engine.

This unit, developed by Salerni, is reported to be a single-stage torque converter coupled to an unusual system of gearing. It is said to have

a high mechanical efficiency and to be suitable for the smallest engines.

Meanwhile, a spokesman for the Ferguson organization has flatly denied news reports that a lawsuit involving patents held by Fred W. Dixon has held up production. This is confirmed by Mr. Dixon, technical director for Ferguson from 1950 to 1952, who evolved many of the novel designs. It is understood that Dixon has been financially compensated for his ideas, and that there have been no legal proceedings.

Deutz Turbocharged Diesel Now Offered in Two Models

Kloeckner-Humboldt-Deutz, AG. of Germany, has completed development of the new Deutz aircooled exhaust turbocharged Diesel engine. Diesel Energy Corp., 82 Beaver St., New York City, is the sole U. S. importer of all Kloeckner-Humboldt-Deutz, AG. products.

Two models are at present available. The eight-cylinder unit without accessories develops 210 hp at 2300 rpm, and weighs less than 2000 lb. It has a bore and stroke of 4.38 by 5.5 in. and a displacement of 649.3 cu in.

The other model is a 12-cylinder engine with a gross rating of 310 hp, weighs less than 2900 lb, and has a displacement of 937.9 cu in. The gross engine rating includes the cooling blower.

The new Deutz aircooled exhaust turbocharged Diesel engines are said to be especially advantageous for high-altitude operation of trucks, construction machinery, pumping sets, Diesel electric sets, mining machinery, etc. They will be sold and serviced by 80 agencies all over the world.

Kelsey-Hayes Subsidiary Erecting Plant in N. Y.

Utica Drop Forge and Tool Corp., recently acquired by Kelsey-Hayes Wheel Co., Detroit, and operated as a subsidiary, will construct a new 80,000 sq ft plant in Whitestown, N. Y. To be located on a 72-acre site, the plant will be used for aircraft parts machining operations. It is scheduled for completion early next year.

Monroe Starts Production At New Plant in Georgia

Manufacturing operations started this month at Monroe Auto Equipment Co.'s new plant in Hartwell, Ga. The newest facility, which contains 100,000 sq ft of floor space, will be used for the production of shock absorbers for cars and trucks, supplementing output at three Michigan plants. The new unit will have an initial capacity to turn out 7500 shock absorbers a day.

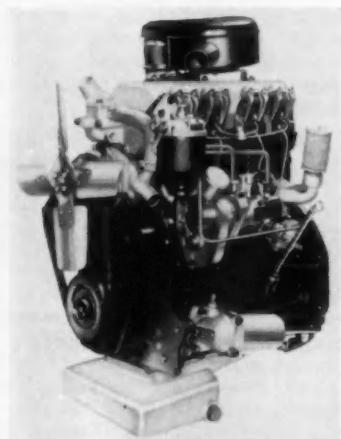
1956 WEEKLY U. S. MOTOR VEHICLE PRODUCTION

As reported by the Automobile Manufacturers Association

	For Weeks Ending				Total Jan. 1 to Sept. 22, 1956
	Sept. 22	Sept. 15	Sept. 8	Sept. 1	
PASSENGER CAR PRODUCTION					
Hudson	390	290	122	10	20,542
Nash	450	314	123	50	48,852
Rambler	1,045	1,234	816	540	4,437*
Total—American Motors	2,683	1,838	1,063	610	73,831
Chrysler and Imperial	0	0	0	0	313,408
De Soto	0	0	0	649	136,455
Dodge	0	0	0	0	71,190
Plymouth	0	0	0	0	79,236
Total—Chrysler Corp.	0	0	0	649	600,209
Ford	12,099	4,925	0	0	901,118
Lincoln and Continental	861	542	417	403	35,549
Mercury	0	1,207	1,463	3,722	186,964
Total—Ford Motor Company	12,960	6,674	1,900	4,125	1,123,631
Buick	7,180	9,213	7,393	7,909	426,096
Cadillac	0	2,976	2,967	1,918	114,983
Chevrolet	10	30,960	25,192	31,335	1,192,929
Oldsmobile	7,120	7,038	5,568	6,480	336,310
Pontiac	5,769	5,156	4,102	5,124	253,928
Total—General Motors Corp.	20,079	55,363	44,842	52,856	2,326,256
Packard	0	0	0	0	13,289
Studebaker	303	0	0	0	54,457
Total—Studebaker-Packard Corp.	303	0	0	0	67,746
Chester Cab	116	99	83	84	2,741
Total—Passenger Cars	36,141	63,974	47,868	56,333	4,194,494
TRUCK PRODUCTION					
Available	7	6	6	7	263
Chevrolet	126	5,949	5,286	6,501	264,235
G. M. C.	1,360	1,935	1,491	1,385	69,473
Diamond T.	129	117	80	99	3,794
Divee	60	60	48	56	2,797
Dodge and Fargo	0	891	0	2,011	63,291
Ford	6,190	6,302	3,490	3,448	224,241
F. W. D.	33	16	16	18	1,248
International	2,623	2,557	1,991	2,822	160,785
Mack	324	326	221	287	13,467
Marmen-Herrington	30	30	8	28	565
Reo	89	71	52	71	2,853
Studebaker	0	0	0	288	11,402
White	370	355	287	344	13,286
Willys	1,457	1,377	1,027	1,452	43,833
Other Trucks	103	75	74	105	4,129
Total—Trucks	12,893	20,079	14,077	16,725	619,683
Buses	80	64	32	54	3,167
Total—Motor Vehicles	49,114	84,106	61,997	77,112	5,017,344

*—Prior to week ending September 1, 1956, Rambler production was included with Nash and Hudson.

AND AVIATION INDUSTRIES



BRITISH DIESEL PUMP

Distributor-type injection pump on this Rootes Group Diesel simplifies the fuel system by reducing the number of moving parts. It is driven from the crankshaft and incorporates a hydraulic governor. The 137.89 cu in. engine with 3 5/16 in. bore and 4-in. stroke develops 54 bhp at 3000 rpm, and a maximum torque of 97.5 lb ft at 2100 rpm. Cylinder block is cast iron with centrifugally-cast slip-fit liners. The power unit is intended for Commer and Karrier trucks in the 3/4 to 2-ton range.

DeSoto Expands Dealer Force With Addition of 68 Outlets

Since May 18, DeSoto has signed 68 new car dealers to its organization. The total includes 10 exclusive DeSoto dealers, bringing to 27 the number of such outlets around the country. The appointment of certain dealers to handle only DeSoto cars is in line with Chrysler Corporation's program designed to ultimately divorce Plymouth from other makes.

Ford of Canada Sales And Earnings Way Up

Ford Motor Co. of Canada, Ltd., had an estimated net income in the six months ended June 30 of \$12,030,686, compared with \$7,430,460 in the corresponding period last year.

Net sales of Ford of Canada in the six months were \$195,601,000. This was an increase of 14.4 per cent over the total of \$170,915,000 in the first six months last year.

AI TABLOID

Vickers, Inc., has established a new Automotive Div. . . Purolator Products, Inc., has created a new Technical Service Dept.

* * *

Borg-Warner International Corp. has licensed the manufacture of Borg-Warner automatic overdrives by Adlerwerke, leading German automotive parts manufacturer.

* * *

Fruehauf Trailer Co. has leased an additional plant in Los Angeles, Calif., for participation in the Government's guided missile program.

* * *

Fuel injection will be introduced on the large Corvette engine that is to be available as an option throughout the 1957 Chevrolet car line.

* * *

AC Spark Plug Div. has formed an engineering group to develop pneumatic-powered automotive components.

* * *

Army Ordnance has completed tests on a new Firestone all-synthetic rubber military truck tire.

* * *

Glenn L. Martin Co. has purchased a site near Orlando, Fla., for electronics work.

* * *

Westinghouse Electric Corp. has disclosed plans for a 70,000 sq ft expansion program for its Air Arm Div.

* * *

Dynatomic Div. of Eaton Manufacturing Co. celebrated its 25th anniversary last month.

* * *

American Brake Shoe Co. has announced that Denison Engineering Co. (a wholly owned subsidiary) has become a division of the company. . . Arnolt Corp. has opened a new Aeronautical Div. in Los Angeles, Calif.

Joseph T. Ryerson & Son, Inc., plans to sell Reynolds aluminum in the area served by its New York plant.

* * *

Deere & Co. has acquired a majority interest in Heinrich Lanz, A. G., a large manufacturer of farm equipment in West Germany.

* * *

Bendix Aviation Corp.'s Cincinnati Div. will occupy a new plant in suburban Hyde Park that will almost triple its facilities for manufacturing dosimeters and nuclear and ultrasonic instruments for numerous industrial applications.

* * *

Renault gas-turbine-powered car (see AI, Aug. 1, p. 55) recently set a new world record of 191.2 mph for gas turbine cars at Bonneville Salt Flats, Utah.

* * *

General Electric Co. plans to consolidate its Aeronautics and Ordnance System Dept. at Schenectady, N. Y., with the Aircraft Products Dept., headquartered in Johnson City, N. Y.

* * *

Pratt & Whitney Aircraft Div. of United Aircraft Corp. will construct an aircraft engine plant and test center near Palm Beach, Fla.

* * *

Exide Batteries of Canada, Ltd., and Willard Storage Battery Co. of Canada, Ltd., have merged under the name of Electric Storage Battery Co. (Canada), Ltd.

* * *

Topp Industries, Inc., plans to acquire the assets of Heli-Coil Corp. . . Superior Brass Works, Inc., has purchased the assets of Kendrick Manufacturing Co.

* * *

Torrington Manufacturing Co. has completed its new Air Impeller Engineering Laboratory.

News of the AUTOMOTIVE

1956 RETAIL CAR SALES BY PRICE GROUPS*

Price Group	Number of Cars				Dollar Volume of Sales			
	July		Seven Months		July		Seven Months	
	1956	1955	1956	1955	1956	1955	1956	1955
	Units†	% of Total	Units†	% of Total	Units†	% of Total	Units†	% of Total
Under \$2,000	85,345	16.20	362,061	96.47	661,927	18.52	2,274,665	54.56
\$2,001 to \$2,500	299,942	56.91	200,872	31.27	1,966,792	55.03	1,306,134	31.34
\$2,501 to \$3,500	121,764	23.11	62,395	9.71	806,209	22.39	467,096	11.21
Over \$3,500	19,905	3.78	16,361	2.55	145,070	4.06	119,764	2.87
Total	526,956	100.00	642,289	100.00	3,573,998	100.00	4,167,661	100.00
	Dollars	% of Total	Dollars	% of Total	Dollars	% of Total	Dollars	% of Total
Under \$2,000	\$ 167,263,770	13.64	\$ 668,531,902	49.22	\$1,208,405,700	15.59	\$4,317,941,454	47.07
\$2,001 to \$2,500	940,961,714	62.28	469,716,516	33.58	4,229,490,882	59.62	3,048,467,156	33.23
\$2,501 to \$3,500	331,999,668	27.07	174,908,399	12.50	2,208,755,921	28.44	1,321,561,097	14.40
Over \$3,500	85,895,117	7.01	65,821,080	4.70	621,888,072	7.44	488,563,581	5.30
Total	\$1,226,060,269	100.00	\$1,368,975,797	100.00	\$8,354,420,555	100.00	\$8,174,803,288	100.00

*—Calculated on basis of new car registrations, as reported by R. L. Polk & Co., in conjunction with advertised delivered price at factory of four door sedan or equivalent model. Does not include transportation charges or extra equipment.
†—New registrations of American made cars only. Does not include imported foreign cars.

Evinrude Motor Line for '57 Has Models from 3 to 35 Hp

Greater horsepower, an automobile-type generator, and slip-clutch propeller to eliminate changing shear pins are the leading features of the 1957 Evinrude outboard motor line. Introduced at a recent press preview in New York City, the 1957 line is said to have 43 major and minor refinements and innovations. The Big Twin model, for example, features a new

air silencer and a new system of reduced compression.

Heading the 1957 line are three new 35-hp units, two of which will be electric-starting with generator as optional equipment. These are the rope-starting and electric-starting Big Twins and the electric-starting Lark, which replace the three 30-hp motors of the 1956 line.

Also introduced are two new 18-hp motors, a rope and an electric-starting unit, both with the new slip clutch. These replace the two 1956 15-hp models.

The use of a new slip clutch propeller on all models, except the 5½-hp Fisherman and 7½-hp-Fleetwin, is accomplished by a rubber hub that has been redesigned to allow the propeller to slip when an obstruction is hit. A stainless steel drive pin replaces the traditional brass shear pin.

Speaking at a press conference held in conjunction with the showing of the new motors, Howard F. Larson, director of sales and marketing for Evinrude Motors, predicted that Americans will spend close to \$1 billion on outboard boats and boating equipment in 1957. He revealed that some five million outboard motors are in use in the U. S. now.

By the end of this year, Mr. Larson said, the industry will have sold approximately 600,000 motors for a retail dollar volume of \$226 million. In 1957, he concluded, the industry may be expected to sell about 700,000 units for a dollar volume of \$280 million.

All-Butyl Tires Developed Through Esso Research Work

Esso Research and Engineering Co. scientists have successfully produced synthetic automobile tires under pilot plant conditions. The all-butyl tires are said to have demonstrated a number of specific safety features, immunity to atmospheric or chemical attacks, smoother riding comfort, etc.

Esso Research is operating a pilot plant at Armstrong Tire Co., West Haven, Conn. Butyl tires are being processed, built, and cured using regular production methods and equipment. Certain tests are also conducted there. The results of this work are then made available to all tire firms.

Esso Standard Oil is, however, developing plans for test-marketing a limited number of the all-butyl tires in about six months probably between 100 and 110 grade. The program calls for the production of some 100 tires per day. First uses would conceivably be on passenger cars and off-the-highway equipment.

CHEVROLET HANGS ON TO POSITION OF LEADERSHIP 1956 New Truck Registrations*

Arranged by Makes in Descending Order According to the 1956 Seven Months' Totals

SEVEN MONTHS							
MAKE	Units				Per Cent of Total		
	July	June	July	1956	1955		
	1956	1956	1955				
Chevrolet	28,738	26,547	30,056	178,995	180,516	33.55	32.69
Ford	23,640	23,418	24,378	159,047	164,789	29.63	31.77
International	9,854	8,984	8,960	64,538	60,496	12.10	11.67
G.M.C.	7,244	6,943	8,031	50,570	41,128	9.48	7.93
Dodge	5,091	5,769	6,277	34,822	38,623	6.47	7.48
White	1,388	1,324	1,224	9,477	7,840	1.78	1.51
Mack	1,165	1,094	877	7,743	8,823	1.45	1.12
Willis Truck	1,111	1,174	1,267	7,684	9,252	1.44	1.78
Studebaker	780	711	825	5,776	6,808	1.06	1.31
Willis Jeep	763	718	886	4,776	5,528	.90	1.07
Diamond T	402	301	307	2,432	2,036	.46	.39
Divco	267	310	254	1,984	1,925	.37	.37
Reo	244	311	280	1,789	1,008	.34	.31
Kanwarth	138	126	105	761	602	.14	.12
Brockway	77	100	91	613	607	.11	.12
Peterbilt	72	77	33	363	254	.07	.06
F.W.D.	34	32	22	256	137	.05	.03
Misc. Domestic	69	124	194	640	551	.12	.11
Foreign	352	477	244	2,449	990	.46	.18
Total—All Makes	76,404	76,901	84,413	533,411	518,496	100.00	100.00

* Based on data from R. L. Polk & Co.

AND AVIATION INDUSTRIES

Ryerson Dedicates Addition To Jersey City, N. J., Plant

In celebration of the completion of an addition which increases capacity 50 per cent, Joseph T. Ryerson & Son, Inc., held "open house" on Sept. 20 at its Jersey City, N. J., steel service plant. The enlarged plant now has approximately 355,000 sq ft of space devoted to warehousing, processing, and shipping all kinds of steel for user needs.

Unique Car Embodies Wealth Of Built-in Safety Features

Engineering designs for a "safety" automobile offering a high degree of protection against common hazards were shown in New York City last month by the Liberty Mutual Insurance Co. and the Safety Design Dept. of the Cornell Aeronautical Laboratory. Simultaneously, it was announced that a prototype of this "crash-proof" car is now being built. The project is the end result of a four-year program in the field of crash research sponsored by Liberty Mutual at Cornell.

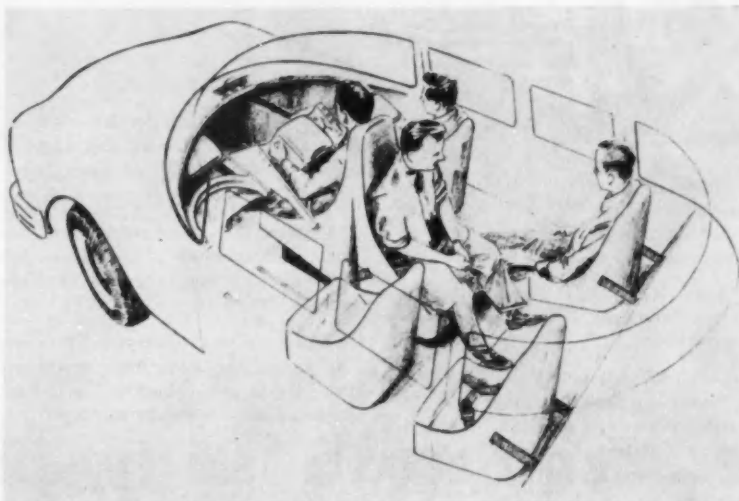
Externally, the safety car (see illustration) resembles a conventional four-door sedan. The inside of the car, however, differs considerably from conventional design.

Most radical is the location of the driver's seat and steering control in the center of the car. The steering wheel has been eliminated to be replaced by a hydraulic, two-handled lever-type control system set parallel to the floor.

The steering mechanism is covered with a chest cushion, beneath which is a webbing yoke. The front compartment passengers are protected by similar webbing yokes and chest pads mounted on pull-out panels.

The driver's seat is flanked on either side by a lower individual passenger seat. A single bucket seat, located directly behind the driver, faces two individual rear seats.

The design and construction of the car doors is unique in that they are rearward-moving, outward-folding, and move like a single accordion pleat. They are held closed by a positive lock which will not spring open during the impact of a crash.



This cutaway sketch shows principal interior design features of the new experimental safety car. Each individual element reflects a general concept of "packaging" the passenger against crash injuries sustained when occupants are thrown against fixed objects inside the car. Note how rear-seat passengers are held in place by aircraft-type seat belts, while driver and front-seat passengers are restrained by movable U-shaped webbing yokes supported between the two side arms.

Another safeguard against crushing of the car body are two W-shaped sheet metal stiffeners built into the roof. These stiffeners extend around the inside of the roof at right angles to the body frame.

Other safety features include: redesigned windshield; wrap-around cushioned bumpers; air scoop built into the roof; and color-coded instrument panel to indicate normal and abnormal car operation.

FORD EDGES UP SLIGHTLY IN MARKET PERCENTAGE 1956 New Passenger Car Registrations*

Arranged by Makes in Descending Order According to the 1956 Seven Months' Totals

SEVEN MONTHS							
MAKE	July 1956	June 1956	July 1955	Units		Per Cent of Total	
				1956	1955	1956	1955
Chevrolet.....	141,737	148,540	150,077	946,837	905,912	26.12	21.75
Ford.....	125,952	120,690	143,197	791,685	864,300	21.85	21.23
Buick.....	44,928	46,060	64,833	339,122	446,441	9.36	10.72
Plymouth.....	44,221	43,024	66,645	301,539	402,208	8.32	9.65
Oldsmobile.....	38,294	39,961	52,350	276,495	342,733	7.63	8.23
Pontiac.....	30,616	31,664	47,330	222,931	312,876	6.15	7.51
Mercury.....	25,951	24,611	35,114	168,843	213,419	4.66	6.12
Dodge.....	20,176	20,790	23,615	133,763	169,590	3.69	4.07
Cadillac.....	11,661	12,433	10,370	85,490	94,549	2.36	2.04
Chrysler.....	11,001	10,567	13,599	73,600	95,801	2.04	2.37
De Soto.....	8,962	9,133	10,985	62,622	74,072	1.73	1.76
Studebaker.....	8,251	6,322	8,995	50,692	62,306	1.40	1.50
Nash.....	7,261	7,171	9,821	48,906	57,062	1.36	1.37
Lincoln.....	4,025	3,677	3,225	25,923	19,727	.72	.45
Hudson.....	2,680	3,250	4,354	21,453	27,874	.59	.67
Packard.....	2,614	2,772	4,916	20,595	31,708	.57	.76
Continental.....	114	106	1,05103
Misc. Domestic.....	457	472	527	2,298	5,868	.06	.14
Foreign.....	7,854	6,733	4,801	48,457	26,154	1.34	.63
Total—All Makes.....	534,907	539,777	647,245	3,623,484	4,165,020	100.00	100.00

* Based on data from R. L. Polk & Co.

Men in the News



Oldsmobile Div., General Motors Corp.—V. H. Sutherland has been appointed general sales manager.

Mercury Div., Ford Motor Co. — **George S. Coats** has been appointed general marketing manager in charge of all sales activities.

Buick Motor Div., General Motors Corp.—**James R. Bolton** was named comptroller.

Lockheed Aircraft Corp.—**Robert E. Gross** has been appointed chief executive officer and maintains his position as chairman. **Courtlandt S. Gross** has been named president.

Ramo-Wooldridge Corp.—**V. G. Nielsen** and **Gordon P. Saville** have been elected vice-presidents.

Consolidated Electrodynamics Corp.—**Holley B. Dickinson** has been named assistant to the president.

Bendix Aviation Corp., Pacific Div.—**Ralph A. Lamm** was named director of engineering.

Ford Motor Co.—**Joseph E. Bayne** has been appointed a member of the Dealer Policy Board.

Electric Auto-Lite Co.—**John W. Lingle** is now merchandising manager for Auto-Lite spark plugs.

U. S. Rubber Co., Footwear and General Products Div.—**Edmund G. Nagle** has been made manager of automotive sales.

E. W. Bliss Co., Mackintosh-Hemp-hill Div.—**John A. Lindberg** has been named manager of manufacturing operations, while **Thomas H. Pattison** has been made manager of the Pittsburgh plant.



Pontiac Motor Div., General Motors Corp.—E. M. Estes has been named chief engineer.

Chandler-Evans Div., Pratt & Whitney Co.—**Kenneth L. Moan** has been made administrative engineer.

Muskegon Piston Ring Co.—**Ernest E. Haack** has been promoted to research metallurgist.

Gar Wood Industries, Inc.—**Joseph R. Hager, Jr.**, has been elected vice-president and director of manufacturing.

Vickers, Inc.—**Gerhard Reethof** has been named chief of research, and assistant chief engineer for development.

White Motor Co.—**Roy A. Fryer** has been appointed advertising manager, and **David W. Sheehan** has been named sales promotion manager.



Ross Operating Valve Co.—Andrew B. Huntington has been named chief engineer.

TelAutograph Corp.—**R. D. Eldridge** has been made purchasing agent.

Pratt & Whitney Co., Inc., Cutting Tool and Gage Divs.—**Earl R. Lewis, Jr.**, has been named production manager.

Ross Gear and Tool Co.—**William A. Blume** is now a vice-president and general manager of the Gemmer Div.; **E. Douglas Graham**, a vice-president and general manager of the Gemmer Div.; **C. F. Hammond, Jr.**, chief engineer of the Development Section; and **Peter Lilicy**, assistant secretary and controller of the Gemmer Div.

Huck Manufacturing Co.—**George Q. Mathews** has been appointed vice-president in charge of sales.



Cross Co.—R. T. Johnstone has been made assistant sales manager.



Automatic Transportation Co.—S. I. Ulin-ski was named director of development and design.

Necrology

Joseph W. C. Bullard, Sr., 74, retired vice-president of Bullard Co., died Sept. 16, at Southport, Conn.

Thomas L. Phillips, 69, a retired vice-president of Westinghouse Electric Corp., died Sept. 9, at Legonier, Pa.

Harry O. Burrows, an executive of Aluminum Co. of America, died Sept. 10, at Cleveland, O.

William H. Hutchins, retired works manager of Deleo Appliance Div., General Motors Corp., died recently, at Rochester, N. Y.

Joseph M. Schaeffer, 71, president of Waterbury-Farrel Foundry & Machine Co., died Sept. 7, at Waterbury, Conn.

Donald L. McClure, 49, general manager of Corrugulux Div. of L. O. F. Glass Fibers Co., died Sept. 14, at Houston, Tex.

Charles H. Bennett, 93, president of Daisy Manufacturing Co. and the last of 12 original stockholders in Ford Motor Co., died Sept. 17, at Plymouth, Mich.

Harold L. Reeder, 53, former production manager and plant superintendent for Electric Auto-Lite Co., died recently, at Toledo, O.

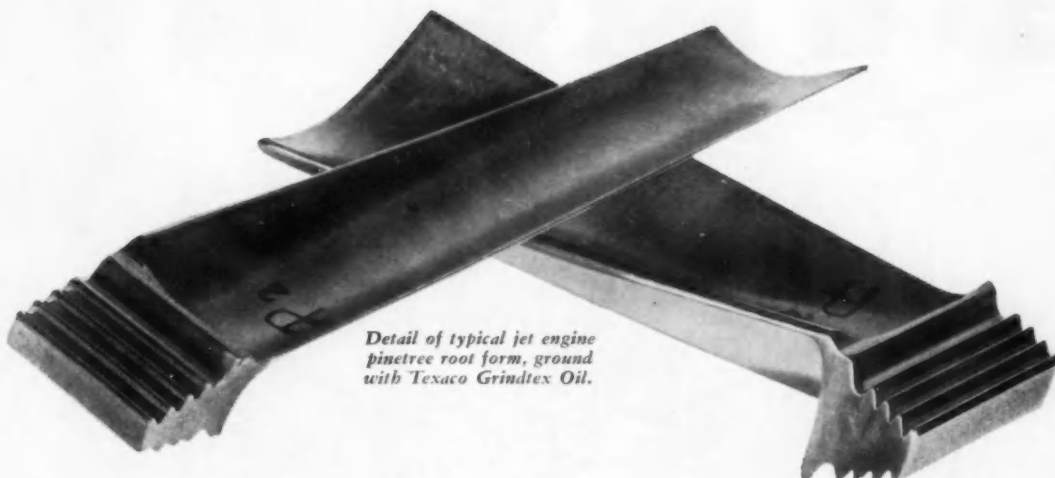
Spencer A. Pease, 68, head of the Material Procurement Div., Briggs & Stratton Corp., died Sept. 10, at Milwaukee, Wis.

Frederick H. Elliot, 79, highway safety expert, died Sept. 13, at New York, N. Y.

Anthony W. Taylor, 56, director of purchases for Crucible Steel Co. of America, died Sept. 15, at Miami, Fla.

Stanley S. Sayres, 60, speedboat record holder, died Sept. 17, at Seattle, Wash.

Robert C. Held, retired sales executive of Electric Auto-Lite Co., died Sept. 12, at Toledo, O.



Detail of typical jet engine pinetree root form, ground with Texaco Grindtex Oil.

Grinds more "pinetrees" between wheel dressings

UTICA DROP FORGE is one of the country's top producers of jet engine blades—doing the complete job from vacuum-melting the alloy to precision forging and finishing.

For the critical form grinding of pinetree and dovetail roots, as well as air foil contours, a Texaco Lubrication Engineer recommended *Texaco Grindtex Oil*—and its use has proved outstandingly successful.

Utica Drop Forge finds *Texaco Grindtex Oil* an important help in holding to the required close tolerances and achieving consistently excellent finish. Wheels last longer and fewer dressings are needed. These benefits add up to a higher output of perfect parts at a lower unit cost.

Be sure you're getting the most from your machines. There is a complete line of *Texaco Cutting, Grinding and Soluble Oils* to help you do *all* your machining better, faster and at lower cost. A Texaco Lubrication Engineer will gladly help you select the proper ones.

Just call the nearest of the more than 2,000 Texaco Distributing Plants in the 48 States, or write:

The Texas Company, 135 East 42nd Street, New York 17, New York.



One of the Ex-Cell-O Precision two-wheel form grinders at the Clayville, New York, plant of Utica Drop Forge & Tool Corporation. Adapted Norton and Thompson grinders are also in use. Metals worked are Nimonic 80 and 90, Inconel 700, Stellite and stainless steels. *Texaco Grindtex Oil* is doing a great job here.

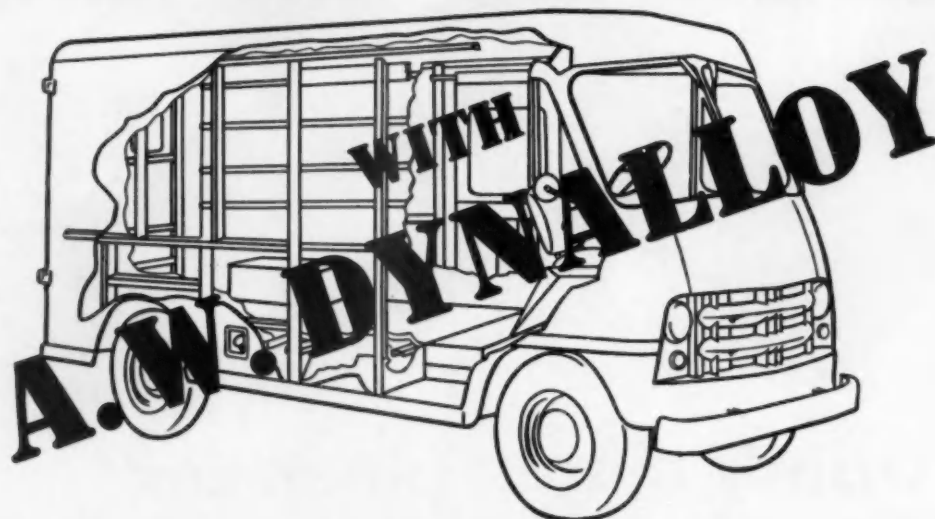
VISIT Texaco Booth 1602, Metals Show, Cleveland, October 8-12



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SOLUBLE AND
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STRONG



...from the inside out!

That's the secret of a Boyertown "Better Built" delivery body. Truck buyers all over the country recognize the built-in durability of every Boyertown body. They offer strength of design, strength of fabrication and the "know-how" of 83 years of body-building experience.

And it starts from the inside—with the basic material—steel. Boyertown uses tough, high-strength, low-alloy Dynalloy by Alan Wood Steel Company. Body members are press-formed into long-lasting lightweight sections by Parish Pressed Steel, a name as old as the auto industry itself.

That combination—

... Dynalloy by **ALAN WOOD**

... press-formed by **PARISH**

... body by **BOYERTOWN**

adds up to **MORE STRENGTH—PER POUND—PER DOLLAR** in your next delivery truck body.

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Plates (sheared)
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(high-strength steel)
Hot rolled sheets
Hot rolled strip
Cold rolled sheets
Cold rolled strip
ROLLED STEEL
FLOOR PLATE
A.W. ALGRIP
abrasive
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A.W. CUT NAILS
Standard &
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MINE PRODUCTS
Iron ore
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* B-N.....your assurance of finer piston pin performance

The Burgess-Norton insignia symbolizes the engineering and production skill that guarantees better performance for industry.

Throughout the years the engineering, metallurgy and production facilities at Burgess-Norton have kept pace with the ever-increasing demands for quality parts. Ability to meet these requirements as to production and quality has made Burgess-Norton the world's largest independent producer of piston pins. Burgess-Norton is proud of its position . . . and with it accepts the responsibility to maintain constant vigilance in quality control, and makes available to industry the latest in manufacturing facilities and methods.

A part is made right only when it is satisfactory to our customer

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Countless hollow parts and products now being made from solid stock can be fabricated more economically from tubing. The hole is there, eliminating heavy drilling with all its attendant waste. And the wide range of sizes, shapes, analyses, finishes and heat-treated conditions in which B&W Mechanical Tubing is available, make it a semi-finished product in itself — reduce all your machining operations to the minimum.

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Write for *Guide to the Use of Seamless Mechanical Tubing, Technical Bulletin 340.*

The Babcock & Wilcox Company, Tubular Products Division, Beaver Falls, Pa.



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Seamless and welded tubular products, seamless welding fittings and forged steel flanges—in carbon, alloy and stainless steels

**So sensitive...
they wouldn't**

crack an egg...

So powerful ➡

HERE'S GRAPHIC PROOF!

In this experimental rig, with power and speed set at a minimum, the Black & Decker Scrugun drives a screw so delicately that the torque doesn't crack an egg! With power and speed set at maximum (see next page), it drives the screw so powerfully that the torque can crack a nut!

**...they
could
crack a nut!**

NOW Black precise control

New "Power-Speed Control" lets you choose the correct speed and tension—from finger-lightness to wrench-tightness!

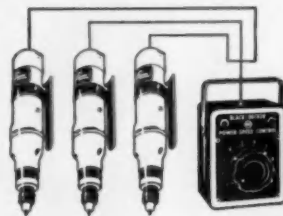
The big news in production-line assembly is the improved line of Black & Decker Scruguns! Now, with new "Power-Speed Control," they bring all the advantages of controlled electric power to every screwdriving application!

They drive machine screws ranging from No. 0 to $\frac{1}{4}$ " in all materials. You choose the precise torque you want—from 1 in. lb. to 145 in. lbs. You choose the precise speed you want—from 500 to 3000 rpm.—an infinite number of speeds for each torque adjustment. And operation is quieter, cooler, cleaner, with one-hand control.

Operating and maintenance costs drop. Armatures, bits and brushes last longer. Installation is quick and inexpensive—just plug it in and go!

Black & Decker gives you a choice of 56 models—*power-built to last!* Regardless of your application, or the type of driver you are now using, you can't afford to miss a free demonstration. See your Black & Decker distributor today or write: The BLACK & DECKER MFG. Co., Dept. 1610, Towson 4, Maryland.

**B&D
"Power -
Speed
Control"**



Unit handles as many as three adjustable clutch Scruguns. Reduces costs and increases life of tool. Rates at 5 amperes. Unlimited life.

Look in the Yellow Pages under "Tools-Electric" for Nearest Distributor.



Black &
Portable electric tools . . .

& Decker **SCRUGUNS**[®] provide impossible with other power drivers!



56 MODELS TO CHOOSE FROM

No. 8 Scrugun:
Lightest, most compact tool for driving up to No. 8 screws. Handles up to No. 8 machine screws and nuts, up to No. 8 self-tapping screws and up to No. 8 x 1 1/4" wood screws.

New, Advanced No. 10 Scruguns
Single adjustable clutch and reversing switch permit close-quarter work and reduce weight. Drives up to No. 10 x 2" wood screws, up to No. 12 self-tapping screws, and up to 1/4" diameter machine screws and nuts. Available as pistol grip handle model with "piggy-back" reversing switch . . . or center-drive model with paddle switch—with positive clutch available on both models.

No. 12 Scrugun:
Pistol-grip handle. Exclusive "piggy-back" reversing switch. Drives up to No. 12 x 2" wood screws, up to 1/4" self-tapping screws, up to 3/16" x 2" lag screws, and up to 1/4" diameter machine screws and nuts. Available with positive or adjustable clutches.

3 TYPES OF CLUTCHES!

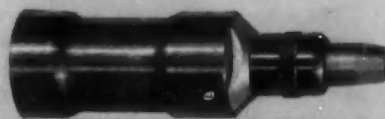
Black & Decker adjustable clutches permit tightening to screw manufacturers' specifications . . . reduce kick-back . . . lower torque . . . cut operator fatigue . . . permit uniform adjustment . . . prevent overloading.



Single Adjustable Clutch minimizes stripping, tearing, reduces burring.



Positive Clutch . . . for driving self-tapping screws, drawing down wood screws . . . wherever definite torque adjustment is unnecessary.



Double Adjustable Clutch eliminates stripping, tearing, reduces burring.

Decker[®]
power-built to last!

Styling and Chassis Changes Mark Chrysler Corp. Cars for '57

Details of Chrysler and Imperial Disclosed

EXTENSIVE chassis changes and completely new styling mark the Chrysler Corp. lines of cars for 1957. Previewed for the press at the Chrysler Proving Grounds in Chelsea, Mich., on Oct. 1, they displayed a number of features common to all five different makes.

Of course, each individual line in the Chrysler family has its distinctive characteristics. These will be detailed in special stories on each of the makes to be published in *AUTOMOTIVE INDUSTRIES* at the proper release dates. It is possible now, however, to disclose specific information on the Chrysler and Imperial lines. A review of their particular features follows this general discussion of the entire Chrysler Corp. array of cars for 1957; unfortunately, no photographs of the Chrysler and Imperial were available for publication at press time.

Changes most noticeable to the public will be in the new styling. The cars have much lower rooflines and feature increased glass area and even more pronounced fins than in 1956. Wheelbase and width in both the Dodge and Plymouth have been increased; Plymouth is up 3 in. in both categories, and Dodge is on a 2-in. longer wheelbase and 3 in. wider overall. Higher-priced lines generally carry the same wheelbase and are about the same length as last year with the exception of Imperial; it has been reduced 4 in. in wheelbase, 5.4 in. in length, and 2.4 in. in width.

All lines are on 14-in. extra low-pressure tires ranging from 7.50 to 9.50 in. section height. The tires help nominally to reduce height but most of the reduction comes from structural design changes.

Overall height on convertibles and hardtops is about 55 in. with sedans measuring about 57 in. The compound "wrapover" windshield is standard on all convertibles and all Imperial models. "A" posts are swept back even more in 1957 and provide 34 per cent more glass in the windshields of sedans and 53 per cent more in convertibles.

Torsion Bar Suspension

The suspension system, called TorsionAire, has been completely redesigned and features torsion bar suspension in front and wider mounted rear springs. Ball joint suspensions are used, and all front members are rubber-insulated. Lubrication points have been reduced from 23 to 8.

The rear springs are mounted with one-third the length ahead of the axle and two-thirds behind it. The spring has more leaves in the front one-third and seven times the frequency rate of the rear section. It is designed to prevent wind-up on sudden acceleration and also provides better cornering. Also included for the first time is an anti-dip design for a level stop.

The new box frame is wider and stronger and so designed as to permit moderately depressed floors to accommodate the lower roof line. Brakes have been reduced in diameter to accommodate the 14-in. diam wheels used across the line but are wider so that effective lining area is not reduced. They are the center-plane type introduced last year on some lines and are referred to as "total contact" brakes.

Engines all are increased in displacement and have higher horsepower and higher compression ratios. New this year is a micronic element carburetor air cleaner which replaces the oil bath cleaner and mounts at the side of the engine. It has a treated paper element which is cleaned by tapping it against a solid surface every 5000 miles, and it needs to be replaced only at 15,000 mile intervals.

Torque-Flite Extended

The new Torque-Flite three-speed transmission introduced by Chrysler last year will be available in all makes, but not all lines. Due to production limitations, it will not be offered on the lower priced Dodge and Plymouth lines. Push-button transmission controls will be retained for 1957, and Dodge, Chrysler, and Imperial will use neutral button starting to replace the key start.

Also new across the board this year is a combined heater and air conditioning unit using common duct work and mounted forward on the firewall. The heater or air conditioner can be installed as separate units or in combination at the factory or by the dealer. All radios to be offered this year are transistorized.

Other new features include aluminum grilles on all lines, a flush cowl air intake replacing the traditional vent, recessed door handles on all lines but Plymouth, and four headlamps optional on the Imperial, Chrysler, and two top De Soto lines.

Station wagons will be separate lines and all will be available with air conditioning for the first time in

(Turn to page 102, please)

Bendix Introduces Electronic Fuel Injection System

A NEW, completely transistorized electronic fuel-injection system, called the Electrojector, has been introduced by the Bendix Aviation Corp. for use on passenger car engines. The timed, self-priming system, was developed principally by the Eclipse Machine Division. It is now ready to be adapted to engines of any car manufacturer.

The system consists of an electric modulator, a fuel-injection distributing commutator, fuel-injection breaker points, and fuel-injection nozzles especially designed to minimize dirt problems.

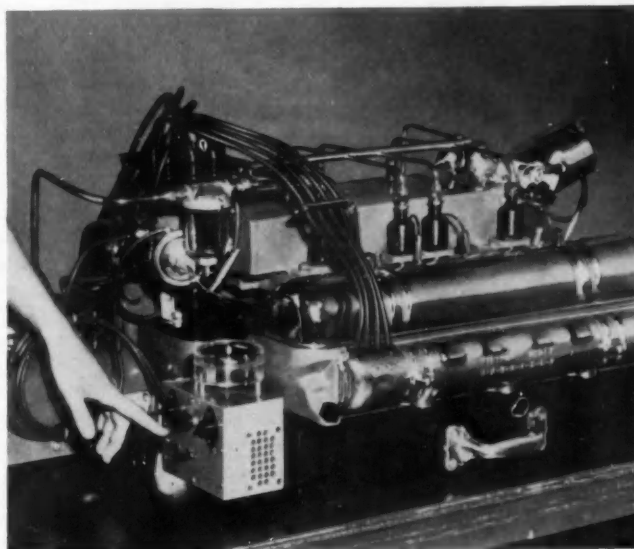
The timing, sensing, and actuating elements feature an electronic pressure sensor, located on the throttle body. Also on the body is an electronic switch to sense and signal the need for proper fuel mixture, either for acceleration or idling. A third feature on the throttle body is an automatic cut-off switch.

The thermistor is located in the water jacket to sense and pass along temperature data to the electronic modulator. This feature is said to provide optimum performance in starting and warming up.

The Electrojector shoots jets of fuel, electronically timed, into the intake ports of an engine's cylinders. Fuel is metered by intake-manifold pressure, controlled automatically by a sensor on the throttle unit.

Another feature of the new automatic unit is its distributor-breaker, which can be installed on any conventional distributor. It will add only about one in. to the height of the conventional distributor. It consists of two parts—the commutator and the breaker points.

The four by five-inch "brain" of the system is the transistor-equipped electronic modulator which re-



Principal components of the Electrojector are shown in this illustration

ceives a timed signal from the distributor-breaker. It coordinates this signal with information from the devices that electronically sense engine operating conditions and continuously sends the correct action signal to injectors located at each cylinder intake port.

Optional features of the system include a device to compensate for ambient temperature variations, and an automatic compensation for altitude variations.

The agreements reached between the four largest rubber companies and the union on new contracts, which embody the Supplemental Unemployment Benefit plan, should assure labor peace for another year in another large industry. Unlike negotiations on similar demands made of automobile companies and the steel industry, agreements between the rubber firms and union were reached without threats of strike demonstrations. Some 100,000 rubber workers are covered by the new contracts.

While the basic principles of the SUB plan signed by the rubber companies are the same as those negotiated by the automobile and steel

Four Largest Rubber Companies Sign Pacts Including SUB Plan

industries, there are some minor, but insignificant, variations. Under the plan, identical for all the rubber companies, the employer will contribute amounts equivalent to three cents an hour for each employee covered into the SUB fund. Automobile companies, under their contracts, are contributing five cents an hour for each worker.

The payment formula is virtually identical, with benefits totaling 65 per cent of take-home pay for a maximum total of 26 weeks. It was not made

clear, however, whether the percentage of take-home pay is reduced after a specified period or whether it continues at the 65 per cent level. Under automobile industry contracts the percentage drops to 60 per cent after four weeks of benefits.

Rubber companies to sign the new pacts include Firestone Tire & Rubber Co., B. F. Goodrich Co., Goodyear Tire & Rubber Co., and U. S. Rubber Co. It has been estimated that a total of \$5 million will be paid into the fund by the rubber companies during the first year. The plan becomes effective July, 1957, and workers cannot draw from the fund until that date.

Trio of Sizes with Many Innovations

Offered by

FORD for '57

1957 FORD CAR SPECIFICATIONS

	Fairlane/Fairlane 500 Sedans & Victorias	Station Wagons	Custom/Custom 300 Sedans
Dimensions (in.)			
Over-all length	207.7	203.6	201.6
Over-all height, loaded	56.2	56.6	57.1
Over-all width	77.0	77.0	77.0
Wheelbase	116.0	116.0	116.0
Tread, front	59.0	59.0	59.0
Tread, rear	56.4	56.4	56.4
Front seat:			
Leg room	45.1	46.4	46.4
Head room	38.9	41.2	40.0
Shoulder room	57.3	57.6	57.6
Rear seat:			
Leg room	42.5	43.3	43.2
Head room	38.0	38.6	38.2
Knee room	16.7	11.4	10.9
Shoulder room	57.0	56.9	57.2

	Thunderbird Special V-8	Thunderbird V-8	Ford V-8	Mileage Maker 8
Engines				
Brake hp/rpm:				
Fordomatic	245/4500	212/4500	190/4500	144/4200
O-Drive or Conv.	245/4500	206/4500	190/4500	144/4200
Compression ratio	9.7:1	9.1:1	8.6:1	8.6:1
Carburetion	4-Venturi	2-Venturi	2-Venturi	Single Throat
Bore (in.)	3.60	3.75	3.62	3.62
Stroke (in.)	3.44	3.30	3.30	3.60
Number and type main bearings	5-copper-lead	5-babbitt	5-babbitt	4-babbitt
Crankcase capacity (qt.)	5	5	5	4
Displacement (cu in.)	312	292	272	223

NOTE: All engines have new replacement element dry-type air filters. The 6-cylinder engine is the 90°-V overhead valve type, and the 8-cylinder is the in-line overhead valve type. V-8's are equipped with automatic choke.

	Passenger Cars		Station Wagons	
General	6	8	6	8
Rear axle ratios:				
Conv. Trans. (std.)	3.70	3.56	3.89	
Conv. Trans. (opt.)	3.89	3.70	4.11	
O. D. Trans. (std.)	3.89	3.70	4.11	
O. D. Trans. (opt.)	3.70	3.56		
Fordomatic (std.)	3.10		3.56	
Fordomatic (opt.)	3.56			
Brake lining area	180.16 sq in.		191.44 sq in.	
Turning diameter	(116 in. wheelbase)		40.13 ft.	
	(118 in. wheelbase)		41.63 ft.	
Water capacity (with heater)	16 qt	20 qt	16 qt	20 qt

NOTE: All models have independent ball joint front suspension, longitudinal semi-elliptical rear springs, 12-volt ignition, 20-gal fuel tank, 27 to 1 over-all steering ratio, Ford rear axle, Hotchkies drive, and 11-in. brake diameter.

FOR the first time in its 53-year history, Ford Motor Co. will produce three basic sizes of Ford cars for 1957—the Fairlane, Custom, and Station Wagon series, each with its own body and chassis—in 19 body styles. In addition, the Fairlane series has been expanded to offer “Fairlane 500” models with extra luxury features.

The 1957 Fairlane and Fairlane 500 sedans are 9 in. longer and 4 in. lower than last year's comparable models. Custom and Custom 300 sedans are more than 3 in. longer and nearly 3½ in. lower than the 1956 models. Station wagons are 3½ in. longer and nearly 6 in. longer. Fairlanes and Fairlane 500's are built on a 116-in. wheelbase. Station wagons, Customs, and Custom 300's have a 116-in. wheelbase.



The Country Sedan is one of five station wagons in the Ford 1957 line of 19 body styles. It comes in nine and six-passenger models, and engine sizes available range from 245 hp down to 144 hp.

CHASSIS IMPROVEMENTS

The 1957 Ford chassis has been redesigned to incorporate a wide-flaring frame with side rails extending around the passenger section, heavier side rail stock, and tubular cross-members. A tapered drive shaft enters the underslung hypoid rear axle almost an inch lower than in 1956.

Swept-back ball joint suspension eliminates 33 per cent of the parts on previous models. Upper and lower suspension arms are now single units, hinged with rubber bushings.

The 14-in. diam wheels have rims with broader shoulders to give tubeless tires a firmer grip for severe turns in emergencies. Fuel tanks have been increased in capacity to 20 gal.

A lower angle steering column and smaller diameter deep-dish safety steering wheel provide more visibility over the hood. Steering ratio is up from 25.3 to 1 to 27.0 to 1.

New outboard-mounted springs are 2 in. longer than on the 1956 model. What is described as an "even keel ride" has been accomplished by increasing the length of the spring leaves ahead of the rear axle. New live rubber mounts are installed at 20 places between the body and the frame.

POWER PLANT OPTIONS

A high-performance V-8 engine is available as an optional power plant on all Ford cars. Called the Thunderbird Special, it has 245 hp and is equipped with a four-barrel carburetor.

Standard engine for the Fairlane and station wagon series is the 212-hp Thunderbird V-8. A 190-hp V-8 is standard for the Custom and Custom 300 series; both have two-barrel carburetors. In addition, the 144-hp Mileage Maker six is available on all models. All en-

gines can be ordered with standard, overdrive, or Fordomatic transmissions.

Advanced design of the engines' carburetion, combustion chamber, and exhaust system, plus stepped-up compression, provide increased operating economy in all models. The dry-type air filter, carburetors, intake manifold, intake valves, camshaft, and distributor are new components.

STYLING FEATURES

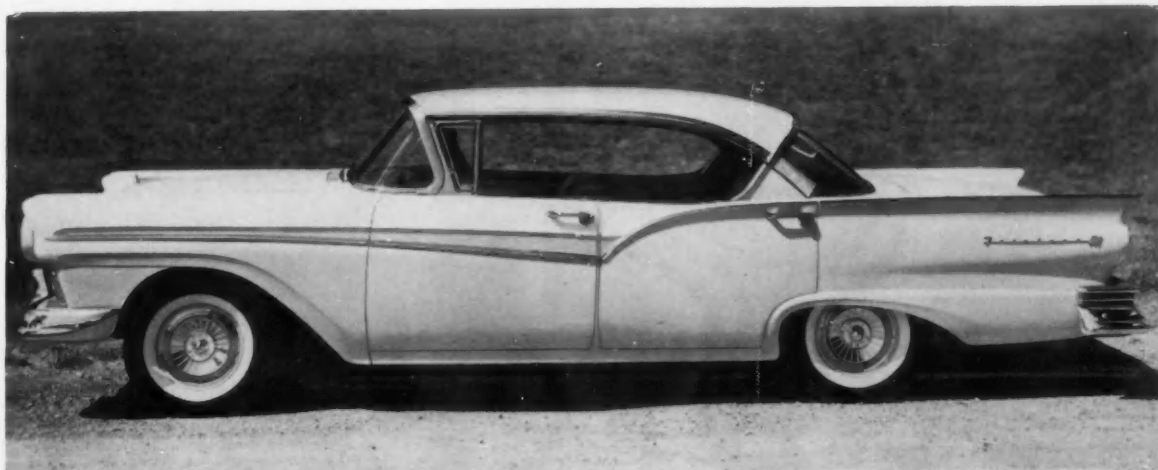
Wide hooded headlights, a forward slanting grille, streamlined wheel openings, a windshield that wraps further around the sides for better visibility, distinctive fins at the rear, and contoured sides are styling innovations that characterize the entire line.

Station wagons have flatter roof lines, with a contoured step-down midway back from the windshield. At the back, the rear window and liftgate wrap around the sides to provide 20 per cent more opening for bulky loads. A new latch opens the entire tailgate with one pull, and the liftgate swings up automatically on concealed torsion bar springs.

Special side mouldings and ornamentation mark each of Ford's five series. They are available in 19 two-tone paint combinations or 12 solid colors.

Safety features introduced in 1956 have been improved. A new safety instrument panel has recessed control knobs clustered under the redesigned deep-center steering wheel. Door latches have been reinforced to withstand greater impacts.

Roofs have been strengthened with steel center bows. Hoods are hinged at the front so air will hold them down if they open accidentally. The hood release has been moved to the instrument panel to make the engine compartment tamper-proof when the car is locked. The fresh air intake has been moved to the cowl in front of the windshield so exhaust fumes are not drawn into the car.



Four-door Victoria shown here is a member of the new "Fairlane 500" series introduced by Ford for 1957. Fairlane models are 9 in. longer and 4 in. lower than their 1956 counterparts.

The Shuttle Piston FUEL INJECTION SYSTEM

A RECENT license and engineering assistance agreement has been entered into between Joseph Lucas, Ltd., Birmingham, England, and Holley Carburetor Co. for the purpose of adapting the Lucas Shuttle Piston fuel injection system for use by the American automotive industries.

Basically, the Shuttle Piston fuel injection system meters, distributes, and injects pressurized fuel into the intake manifold upstream but in the near vicinity of the intake valve of each cylinder of the engine.

The system is composed of four major components: (1) the constant pressure pump; (2) the metering unit or metering distributor; (3) the mixture control, and (4) the injection nozzles. An electric driven, constant pressure pump located in the fuel tank feeds filtered fuel to the metering unit at high pressure. The schematic illustration of the Shuttle Piston fuel injection system shows the functional components from the metering unit to and including the injection nozzles.

In detail, the metering unit consists of the main body and its integral sleeve containing the feed channel to all inlet ports. Through these two ports is located a fuel outlet port to each cylinder. An inner sleeve, which rotates at camshaft speed, is located within the non-movable body sleeve. The rotating sleeve carries two orifices drilled at right angles to one another, but displaced axially. Housed within the rotating sleeve is the mechanical, or fixed stop, and the control stop. The desired fuel metering is accomplished by the axial positioning of the control stop, which regulates the displacement or stroke of the shuttle piston, located in the rotating sleeve and between the two stops.

The regulation of the shuttle piston displacement, in turn, establishes the quantity of fuel flowing and injected into each cylinder intake via the nozzles. The shuttle piston is actuated between the two stops by the fuel pressure. At the end of the cycle of each fuel charge injection, when the shuttle piston reaches the stop, there is no further fuel flow

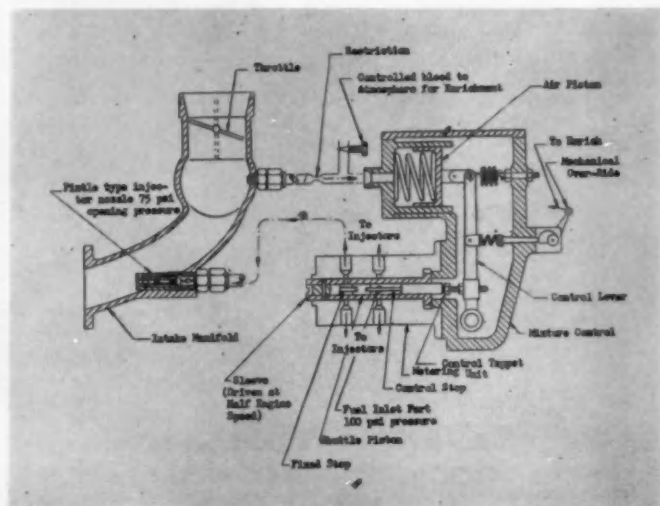
and continued rotation of the sleeve completes the cut-off to that cylinder. Simultaneously, the proper distribution is obtained by means of proper alignment of the two orifices in the rotating sleeve to the respective ports in the body; i.e., one of the sleeve orifices to the inlet port and the other sleeve orifice to the outlet port, and thus to the injection nozzle located in the appropriate cylinder intake area.

This cycle is repeated for the injection of the timed fuel charge to the next cylinder in correct sequence, except that the two orifices in the rotating sleeve are aligned to the opposite ports in the body; consequently, the shuttle piston's direction of travel is reversed. In traveling an exactly equal distance back to the other stop, it displaces an equal quantity of fuel through the outlet port to the injector nozzle. Once again the fuel ceases flowing and the continued rotation of the sleeve completes the cut-off to the cylinder. The rotation continues but the procedure reverts back to the first cycle described and the fuel charge is distributed to the third cylinder in order, etc.

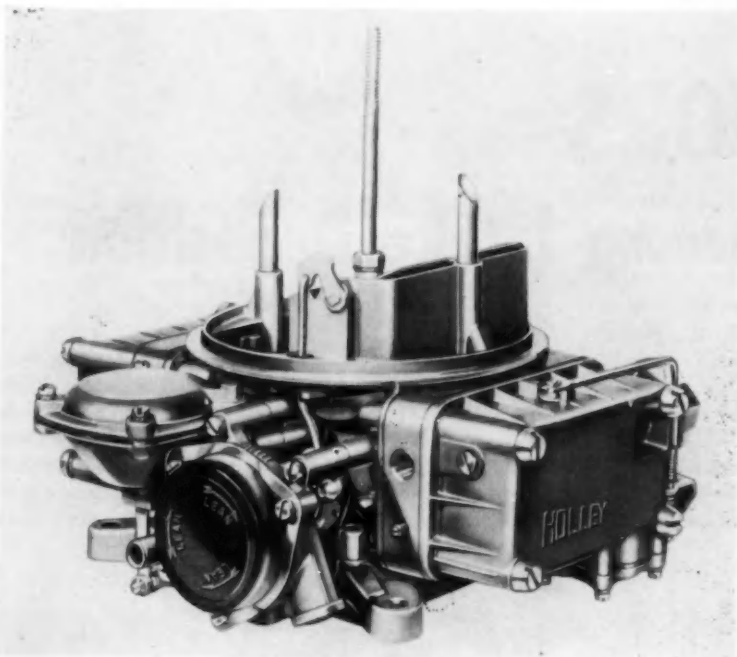
The proper fuel metering is regulated by the manifold pressure in the component called the mixture control. Regulation is accomplished mechanically by positioning the variable position control stop in the metering unit. The mixture control is directly attached to the metering unit.

Pressure in the intake manifold is fed to the spring loaded side of an air piston in the mixture control. When the manifold pressure is near atmospheric pressure, such as is the case during full throttle operation, the air piston is extended by the piston spring to a predetermined maximum point. By means of levers this positions the control stop within the rotating sleeve of the metering unit to a point allowing

(Turn to page 132, please)



Schematic illustration of the basic Shuttle Piston fuel injection system



1957 four-barrel Holley carburetor for passenger cars

Design and Operation of New Four-Barrel Holley Carburetors

TWO new four-barrel carburetors developed by Holley Carburetor Co. will be used on some 1957 Ford Motor Co. cars and trucks. Model 4150 will be used on Thunderbirds, Mercurys, and Ford police and power pack units. Model 4150-G will be used on the 8-cylinder heavy trucks.

Embodying new concepts in carburetion, they are four-barreled units, acting as two dual downdraft carburetors, with two barrels supplying a fuel-air mixture throughout the entire range of engine operation, the other two going into use only when called upon by speed or load and not because the accelerator is pressed beyond a certain point. Manifold vacuum controls the secondary barrels.

The two primary barrels have a common choke plate, while each barrel has its own venturi, main fuel discharge nozzle, boost venturi and throttle plate.

The choke plate on passenger cars is controlled by a thermostatic automatic choke mechanism mounted on the carburetor main body, while on the truck carburetor the choke plate is controlled manually. Each of the secondary barrels has a venturi, main fuel discharge nozzle, a throttle plate and a boost venturi.

There is a fuel bowl for both the primary and secondary barrels, insuring a constant head of fuel for all the fuel metering systems. Fuel from these bowls flows into the primary main metering body and secondary main metering body where it is correctly mixed with air for all phases of engine operations.

The main metering unit, introduced in these carburetors, provides the metered fuel for all the fuel systems. The metering unit is replaceable, presenting a new feature for easier servicing.

Additional fuel for acceleration is supplied by a new type cam-operated accelerating pump on the fuel bowl. The pump begins to function when the pump lever is activated by the throttle lever assembly. The cam on the pump lever provides an "override" feature, allowing a prolonged discharge of fuel for smoother acceleration.

An automatic power enrichment system, actuated by manifold vacuum, delivers an added supply of fuel for full power or high speed operations. Each metering body is equipped with a power valve that supplies the

system with additional fuel when the primary and secondary throttle plates are open. The primary throttle bores supply the fuel-air mixture until the primary throttle plates reach a predetermined opening, then the secondary throttle bores start supplying the added fuel.

Carburetor Model 4150-G is equipped with the Holley Centri-Vac governor, which has been designed and engineered as an integral part of the carburetor. This unit is said to accurately control engine speed without excessive overrun or surging, regardless of variation of loads on the engine due to driving conditions.

Another innovation is in the new compression fitting gaskets which, when compressed, form a more positive seal. This new type gasket eliminates use of a torque wrench, thus making servicing easier.

These carburetors, like their predecessors, are practically surrounded by the air cleaner, which fully protects the units against dirt in the air. The filtered air flows vertically downward through the main body through all four barrels, resulting in truly concentric air flow.

(Turn to page 102, please)

FUEL FACTORS

influencing Intake Deposition

THE problem of minimizing induction system deposition has plagued the refining industry intermittently since the early Twenties when thermal cracking began to be employed. The control of the deposit-forming properties of gasolines by additives and through refining techniques became an essential part of petroleum processing, and it has

stability in accelerated tests and for a time were actually considered to be beneficial as oxidation inhibitors. For this reason the caustic treating processes used for sulfur removal were designed so that these compounds were allowed to remain in the finished gasoline. Shortly after World War II an epidemic of intake deposition complaints was experienced. Field

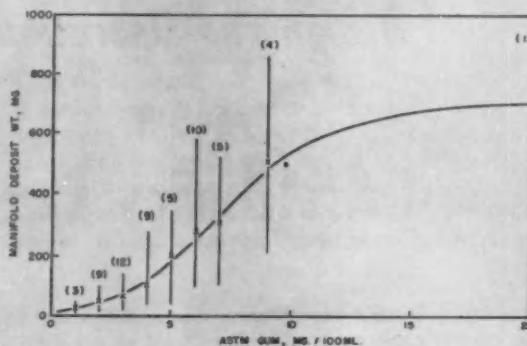
FIG. 1
THREE MAJOR FACTORS CONTRIBUTE
TO INTAKE DEPOSITS

- I AIR-BORNE CONTAMINANTS
 - A. EXHAUST AND CRANKCASE FUMES
 - B. ROAD DUST
- II PREFORMED GUMS
 - A. HYDROCARBONS
 - B. NON-HYDROCARBONS
- III GUMS FORMED IN THE MANIFOLD
 - A. LIQUID PHASE REACTIONS
 - B. VAPOR PHASE REACTIONS

played an important role in making possible the advancement in fuels that has been so necessary for today's modern high-compression engines.

During the period from the early Twenties to the present, the problem has varied considerably in severity and in the manner in which it has been manifested. The initial surge of trouble associated with thermal cracking was eliminated first by chemical processing and finally by the use of additives. This occurrence of the problem was almost entirely attributed to performed gums, which frequently exceeded 50 mg/100 ml. With the advent of catalytic cracking, stability problems were made more complex by the introduction of new types of hydrocarbons and larger quantities of non-hydrocarbon constituents, particularly of the oxygenated type frequently referred to as acid oils. These compounds gave false indications of

FIG. 2
PREFORMED GUMS INCREASE
BAFFLED MANIFOLD DEPOSITS



studies by Moriarty and Johnstone (Ref. 1) and subsequently laboratory investigations by A. C. Cabal (Ref. 2) indicated that these difficulties were probably attributable to the presence of acid oils. In most instances the trouble was eliminated by the application of more efficient caustic washing for the removal of phenolic material as well as some of the more acidic sulfur compounds.

It became apparent during this period that non-hydrocarbon constituents were playing an increasingly important role in the formation of intake deposits. In many instances of deposition problems the gum contents of the gasolines were at levels which previously had been considered satisfactory, indicating either that the physical properties of the preformed gum differed from gum associated with earlier gasolines or that the non-hydrocarbon components

By H. J. Scheule

Petroleum Laboratory

E. I. du PONT de NEMOURS & CO., INC.

were capable of producing deposit-forming constituents during their passage through the intake system.

FACTORS CONTRIBUTING TO INTAKE SYSTEM DEPOSITS

In the study and solution of a problem of this type, it is usually helpful to consider all the possible vari-

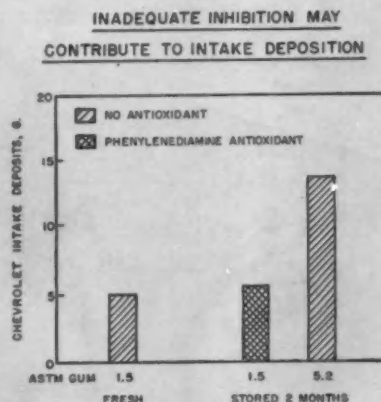
tendencies of a fuel to form intake deposits. More recently, however, it has been recognized that factors other than ASTM gum contribute to induction system deposits (Ref. 2). Hence, it is possible for two gasolines having the same ASTM gum content to vary considerably in their deposit-forming characteristics. Nevertheless, there is considerable evidence indicating that high-gum-content fuels cannot be tolerated. The upper limit established by the Coordinating Research Council (CRC) in road tests conducted at Camp Bullis, Calif., during 1944 and 1945 was 7 mg/100 ml (Ref. 4). More recent studies by the CRC using small-scale, auxiliary-type Ordnance engines support the previous findings regarding gum tolerance and the importance of preformed residues as measured by the ASTM Gum Procedure (Ref. 5).

The fact that there exists a poor, but significant,

FIG. 3.

MODIFIED FL-2 TEST CONDITIONS		
	MODIFIED FL-2	STANDARD FL-2
RUN DURATION, HR	60	40
BRAKE HORSE POWER	30	45
FUEL CONSUMPTION, GAL.	225	180
AIR-FUEL RATIO	14.5	14.5
COOLANT TEMPERATURE, °F	95	95

FIG. 4



ables and attempt to place them in their proper perspective. As is shown in Fig. 1, the factors contributing to intake deposition may be grouped into three categories.

Item No. 1 will be mentioned only briefly since it does not fall within the scope of this paper. Therefore, the discussion will be centered primarily around Items Nos. 2 and 3, which are related more directly to the properties of the gasoline.

PREFORMED GUMS

With respect to preformed depositing materials, there has been considerable controversy during the past few years concerning the significance of gum content as determined by the ASTM Air Jet Procedure. In the past this measure of fuel quality had been generally accepted as a reliable indication of the

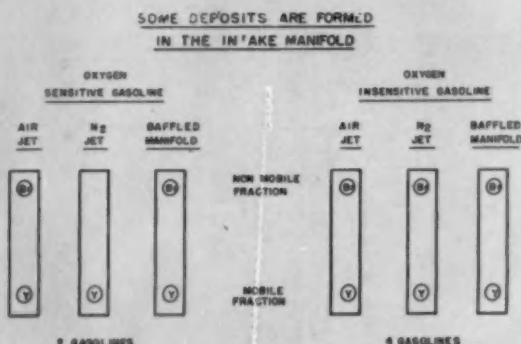
relationship between ASTM gum and the intake-depositing properties of gasolines is shown in Fig. 2. In this figure the deposit-forming characteristics of the gasolines are expressed as milligrams of deposit accumulated in a single cylinder Lauson engine equipped with a baffled intake air heater as the intake manifold. The procedure used was a modified version of the Union Oil Company's Baffled Manifold Test (Ref. 6) and was identical with that employed by C. R. Bauer in the studies described in his paper presented at the ASTM Symposium on Gum and Storage Stability Characteristics of Motor Gasoline held in Philadelphia, February, 1954 (Ref. 7). The relationship shown represents the results obtained on 58 different commercial gasolines; the number of gasolines representing each gum level is shown in brackets.

It is apparent from the spread of these data that

ASTM gum cannot be used as a reliable measure of the deposit-forming properties of a gasoline. It is equally apparent, however, that there exists a definite relationship between preformed gum and manifold deposition. We must conclude, therefore, that preformed gum contributes markedly to deposit formation and that its control during storage is of utmost importance.

A direct indication of the relationship between ASTM gum content and intake deposition was obtained by conducting full-scale engine tests on a single gasoline at two different gum levels. The difference in gum level was obtained by storing the gasoline for two months in the presence and absence of an anti-oxidant. The gasoline employed was composed of catalytically cracked distillate, motor alkylate, and straight-run components.

FIG. 5



Initially and following the storage period, the deposit-forming properties of the samples were determined using a slightly modified version of the CRC, FL-2 Procedure. The modifications, shown in Fig. 3, were incorporated to accentuate deposit formation. This effect was accomplished by extending the operating time, decreasing the power output, and decreasing the temperature of the hot spot in the intake manifold. At the completion of the run, the deposits were collected from the manifold, intake ports, and valve tulips. They were removed by a solvent mixture of acetone-methanol, using mechanical scraping where necessary to loosen the hardened deposits.

The results obtained in this series of tests are summarized in Fig. 4 in which the total induction system deposits, expressed in grams, are expressed as a function of preformed gum. These data indicate that an increase in preformed gum from 1.5 to 5.2 mg increased the deposit-forming properties of the gasoline nearly threefold.

The lack of a more exact relationship between preformed gum and intake deposition can probably be explained by the observation that only a small portion of the material measured as ASTM gum actually remains in the induction system and that this portion is not necessarily proportional to the total gum content for various gasolines. For example, if it is assumed that the deposits are derived entirely from the preformed gums, the quantities shown in Fig. 4 represent roughly only 30 per cent of the gum in the 225 gal of gasoline passed through the intake system in each of the engine runs. By the Baffled Manifold Procedure the deposit weights varied from 5 to 50 per cent of the gum contents and averaged about 25 per cent.

Another consideration relating to preformed deposits is the occurrence of insoluble deterioration prod-

FIG. 6

ENGINE OPERATING CONDITIONS	
INTAKE MANIFOLD TEMPERATURE, °F	138
INTAKE MANIFOLD VACUUM, IN. Hg	10
GASOLINE CONSUMPTION, LB. /HR.	30
ENGINE SPEED, RPM	2000
BRAKE HORSE POWER	55
AIR - FUEL RATIO	14.7

ucts during storage. This problem is associated generally with high aromatic gasolines which form very little gum but which peroxidize to the extent that TEL oxidation is initiated. In some gasolines insoluble deterioration products also are formed from non-hydrocarbon constituents of the gasoline. These forms of deterioration may in some instances become the limiting factor with respect to the useful life of a fuel. In a recent study involving the stability and deposit-forming characteristics of present-day gasolines, the formation of haze was observed in a number of the samples which had not been inhibited adequately against oxidation. There were, in all, six basic commercial blends, five representing premium-grade gasolines and one representing a regular-grade gasoline. With the exception of the latter, which contained as its major component natural gasoline, the blends were composed predominately of catalytic cracked stocks with minor portions of catalytic reformat, thermal cracked, and straight run. The tendency to

form precipitates was observed in two of the six gasoline blends during storage. CRC, FL-2 tests conducted on these gasolines disclosed that TEL decomposition products deposited on the carburetor throttle plate.

It has been proved in tests that the phenylenediamine-type antioxidant at 8 lb/1000 bbl successfully inhibited the formation of a haze in the gasoline and thereby eliminated subsequent carburetor deposition. At 32 lb/1000 bbl the alkylated phenol-type was not sufficiently effective to inhibit the formation of haze for nine months of storage. In this particular instance, the underlying cause for the difference in performance of the gasoline was the difference in oxidation stability provided by the antioxidants. Instability promoted by copper contamination produces the same result. The inhibited sample, not deactivated, proved

obtained by air jet evaporation, nitrogen jet evaporation, and from the laboratory baffled manifold apparatus. Development of the chromatograms using a mixture of alcohol and water disclosed that the composition of the deposits from the air jet evaporation and the laboratory manifold test were essentially identical. However, of the deposits obtained by nitrogen jet evaporation, two of the six differed noticeably in that the heavy, non-mobile portion was completely lacking. This study provides rather conclusive evidence that there are some oxygen-sensitive fuels which contain components capable of forming deposits during carburetion and passage through the intake manifold.

The next logical step in the analysis of this problem was to establish whether the deterioration associated with the oxygen-sensitive fuels occurred in both

FIG. 7

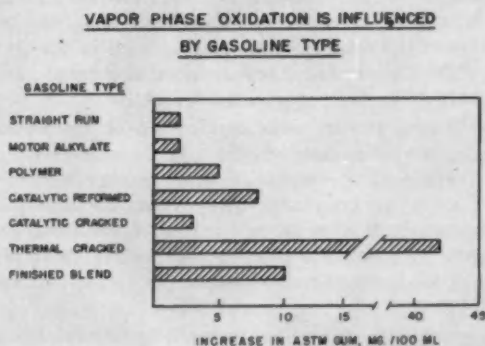
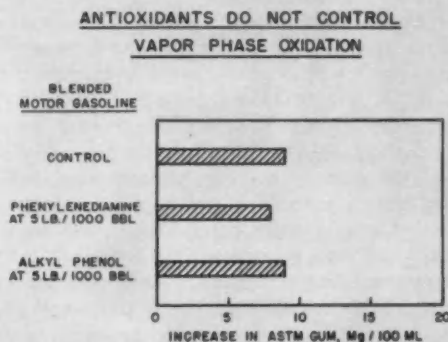


FIG. 8



unsatisfactory, while the sample containing 1 lb/1000 bbl of metal deactivator performed satisfactorily at the end of the nine-month storage period. The haze formed during storage had no measurable effect on other sections of the intake system, although it is suspected that it would eventually plug fuel filters of the resin-coated, stacked paper type.

REACTIONS OCCURRING IN MANIFOLDS

These findings demonstrate that preformed gums affect intake deposit formation and could conceivably be the major factor involved. It has been established, however, that in some instances compounds are found in manifold deposits and in gums from air jet evaporations which are not present in the fuel. Paper chromatography has been applied to gasoline residues in order to establish similarities in compositions (Ref. 7). Figure 5 illustrates the type of chromatograms obtained on deposits from six different gasolines. The deposits in this series of experiments were

the liquid phase and the vapor phase. Since this could not be established by chromatographic studies of the deposits, it was necessary to consider other approaches. The method selected was that of obtaining vapor samples from the intake manifold of a 1955 V-8 automotive engine that was operated under the conditions in Fig. 6.

The samples were withdrawn from the four most extreme sections of the intake manifold, approximately one inch from the intake ports of cylinders 1, 2, 7, and 8. The vapors were withdrawn through 1/4 in. stainless steel lines into four banks of three condensers each. The openings of the stainless steel probes were centered in the manifold in order that the liquid gasoline film from the manifold surfaces would not be included in the sample. Methyl alcohol that had been cooled to -50 F by contact with carbon ice was circulated through the condenser. The sample receivers which were placed between the condensers and vacuum source were packed in carbon ice to mini-

FIG. 9

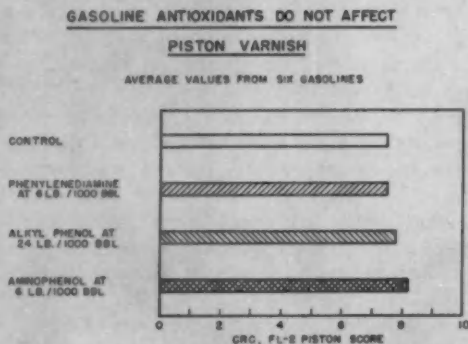
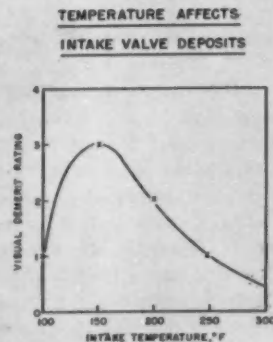


FIG. 10



mize sample loss. With this procedure it was possible to recover approximately 60 per cent of the fuel withdrawn from the manifold.

In order to determine the extent of deterioration occurring in the vapor phase, the gasolines supplied to the engine as well as the samples recovered from the manifold were subjected to ASTM gum determinations, infrared and ultraviolet spectra, and peroxide determinations. In Fig. 7 is shown the increase in total ASTM gum content for a number of different types of blending stocks as well as a blend containing 90 per cent catalytic distillate. These gums were oily in nature and were almost entirely soluble in pentane. The reproducibility of duplicate tests was extremely poor, which detracts from the significance of the values shown. The samples were probably contaminated to some extent by lubricating oil introduced through the valve guides; however, it is believed that the values reflect in some degree the relative deterioration occurring in the various gasolines. With certain reservations, therefore, it may be stated that appreciable deterioration occurs in the thermal distillate and to a lesser extent in the finished blends, catalytic reformat, and polymer gasolines. The least

change occurred in the saturated hydrocarbons. Pentane washed gums, also determined in this study, were unchanged by the passage of the gasolines through the manifold. It appears, therefore, that the end product of the deterioration which occurs in the manifold differs somewhat from the normal concept of the physical properties of gasoline gum.

Additional studies were carried out on the blended gasoline to determine whether the formation of the oily residue of the manifold samples was influenced by gasoline antioxidants. The results of these tests are shown in Fig. 8. It is apparent from these data that the form of deterioration observed in these tests cannot be inhibited by commercial gasoline antioxidants.

Peroxide determinations as well as ultraviolet and infrared spectra indicated that no chemical change had occurred in the fuels obtained from the manifold. In light of these data, it is doubtful that vapor phase oxidation has an important influence on intake deposition. This indication is not unreasonable in view of the fact that the residence time of the fuel in the vapor phase is less than 0.02 seconds in the longest branch of

(Turn to page 122, please)

FIG. 11

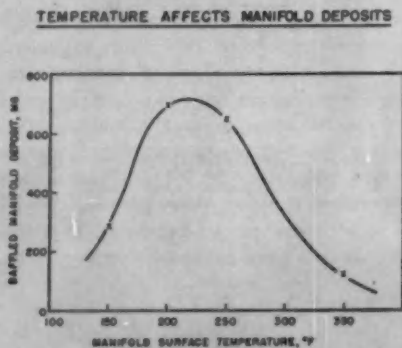


FIG. 12

CONCLUSIONS

1. PREFORMED GUM EXERTS A MAJOR INFLUENCE ON INTAKE DEPOSITION.
2. IN OXYGEN-SENSITIVE GASOLINES NON-VOLATILE COMPONENTS ARE FORMED IN THE MANIFOLD.
3. GASOLINE DETERIORATION IN THE MANIFOLD OCCURS PREDOMINANTLY IN THE LIQUID PHASE.
4. VAPOR PHASE OXIDATION HAS LITTLE EFFECT ON INTAKE DEPOSITION.

THE Continental Mark II once again has broken with tradition with the announcement that the car will preserve its present styling features during the 1957 model year. This is in keeping with the merchandising concept inherent in the original designation of the Continental as a Mark II, rather than that of a particular model year.

However, a number of refinements and improvements have been made throughout the car. Still better performance is provided as a result of the introduction of a new high-compression engine, an improved transmission and a high air flow carburetor.

The increase to a compression ratio of 10 to 1 has been made possible through the use of newly-designed chambers and a reshaping of the pistons. Displacement of the engine remains at 368 cu in., and the bore and stroke are 4.0 and 3.66 in. re-

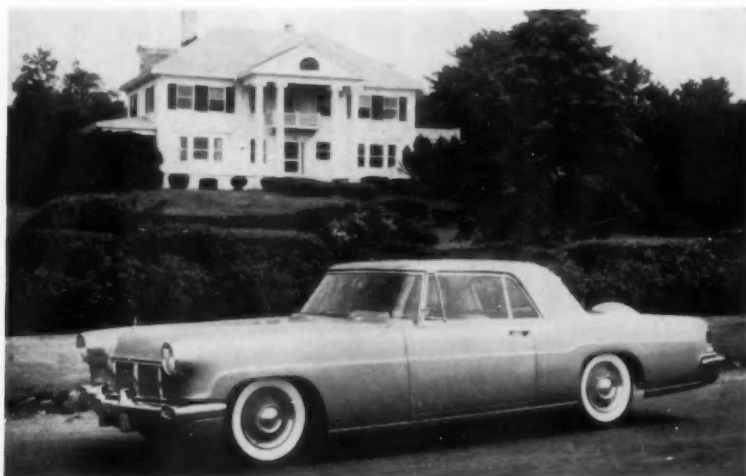
Transmission changes involve the use of a steel converter with a smaller diameter than the aluminum converter previously used.

Other additions to the car include a new locking differential, automatic headlamp dimmer and 40-amp generator, while refinements have been made in the frame, brakes and power steering.

A reduction in the weight of the car from 4825 to 4797 lb, due principally to frame weight reduction, has been achieved without sacrificing torsional rigidity and smoothness of ride. Transfer of this rigidity to the body is aided by the use of steel in place of rubber shims in some areas.

New brake linings give more efficient performance with less braking. As a result of the use of modified power steering control springs, less effort is required in steering, both in parking and on the highway. These springs are said to eliminate "wheel fight" from rotational shock by preventing the steering wheel from turning in the driver's grasp when the car is traveling over a rough surface.

For 1957, a front-end intake serves an air conditioning unit in the rear. Formerly a casting inserted into the leading edge of each of the rear quarter pan-



Newest version of the Continental Mark II

Continental Mark II Continued for 1957

els, the intake now is a take-off from the fresh air duct in the engine compartment. A valve allows fresh air to bypass the heater and flow through the outer rocker panel by means of a tube which connects with ductwork concealed within the body of the car. The relocation has made possible the elimination of a back seat control which had been present in the package tray of Continental Mark II's which were produced previously.

Roof registers at each of the four passenger locations may be adjusted individually to control both the amount of incoming air and the direction of its flow. As in the past, the lever which turns the system off and on is found in a throttle-type arrangement convenient to the driver and atop the transmission housing.

A self-regulating electric clock automatically corrects itself by adjusting its rate of speed when the hands are set.

Seat belts, shatter-proof mirrors, and padded instrument panels and sun visors are available. The instrument panel and inside mirror frame are padded with vinyl foam, while the nylon seat belts are bolted to both the body and the chassis.

Monroe Auto Equipment Starts Plant Operations at Georgia

Monroe Auto Equipment Co. dedicated its new manufacturing plant in Hartwell, Ga., on Sept. 14. The

new facility is an efficient modern building containing 100,000 sq ft of floor space.

Although ample room for expansion is available, the Hartwell Mon-

roe plant will start operations on the production of shock absorbers for cars and trucks. The plant as completed, has a capacity of 7500 shock absorbers per shift per day.

High-Thrust Jets and Rockets Featured at Farnborough Air Show

By David Scott

THE past year has been one of consolidation for the British aircraft industry, and emphasis at the Farnborough Show in September was on engines, aircraft and auxiliary equipment already in production more than on disclosing prototypes and new designs. The display was aimed at promoting exports, to maintain the momentum gained recently. During the first six months of this year the value of aero exports from the U.K. reached the equivalent of \$183 million—75 per cent more than for the same period in 1955.

Over 6000 foreign guests of the sponsoring Society of British Aircraft Constructors were present from 120 countries. This record number included nearly 500 from the United States, and many top-ranking officers of the Russian air force and senior officials of the Russian aircraft industry. The exhibition was also on the largest scale yet, with 338 British manufacturers—20 more than last year—taking part.

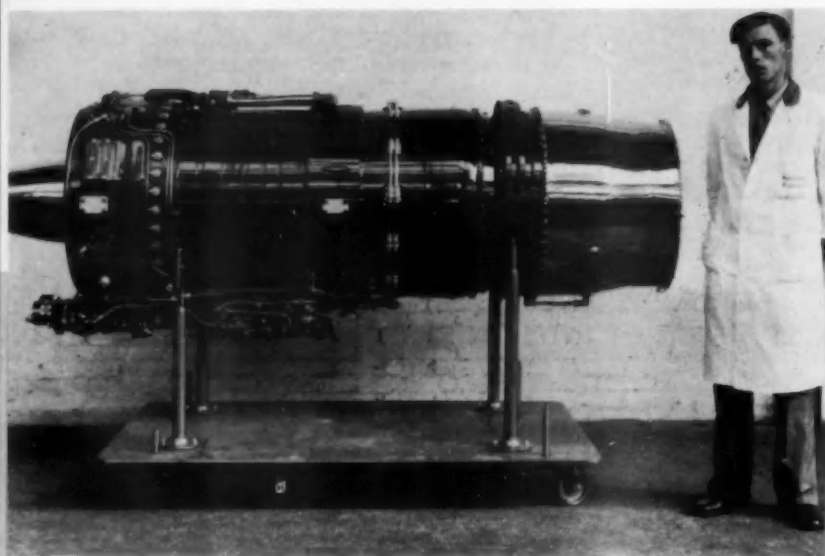
Despite the predominantly commercial nature of this year's Farnborough display, several new engines,

rockets and ram jets were shown publicly for the first time. De Havilland unveiled its Gyron Junior turbojet, of low specific weight and small frontal area, but gave out no information on its performance or construction. This is understood to be a scaled-down version of the 15,000-lb-thrust Gyron introduced a year ago, and to be intended for advanced supersonic and tactical aircraft. Unofficial flight approval tests at the designed thrust have been passed. (This is believed to be in the region of 10,000 lb). The larger version is a single-shaft machine with multi-stage compressor, annular combustion chamber, and multi-stage turbine.

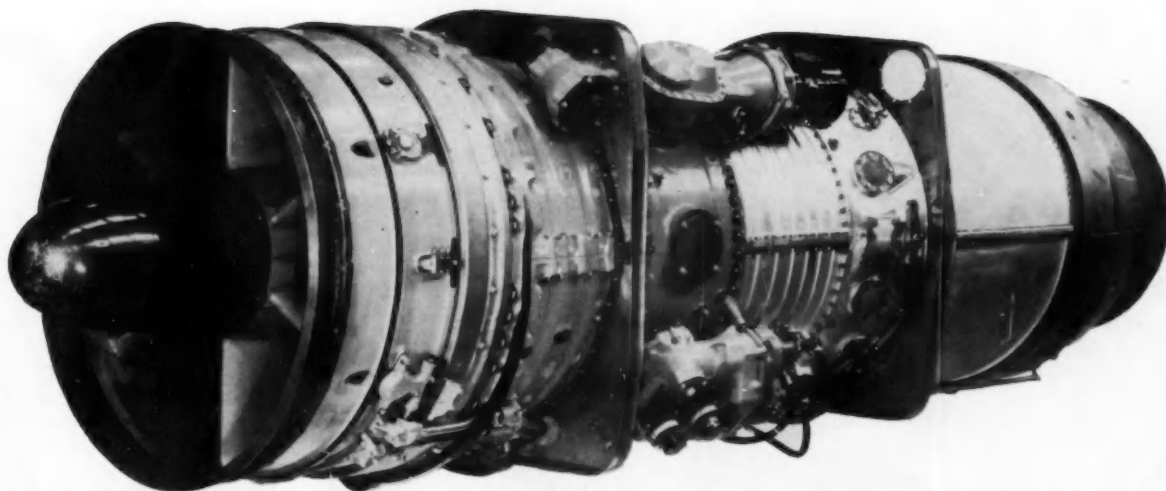
On the eve of the show Bristol released some information on the latest development of the Olympus—the B.01.6. At 16,000 lb thrust without afterburner, this has the highest known power of any British aircraft engine. Of two-spool layout, it has split compressors driven by individual turbines, a design giving unusual thrust-to-weight ratios and low fuel consumption over a wide range of altitudes. The Olympus is built under license by Wright in America, where it is designated as the J-67.

Another Bristol exhibit was the Orion, formerly known as the BE-25. Rating is now 4400 shaft hp, plus 1950 lb jet thrust at sea level, giving a total of 5150 effective hp. The Orion is the first supercharged turboprop, and is designed to give constant power under all take-off conditions and at all altitudes up to 20,000 ft. During the flying display it was demonstrated in a Britannia. The Bristol Orpheus jet, powering a Folland Gnat, was revealed to have type ratings of up to 4850 lb thrust and to have completed over 5000 hours of development testing.

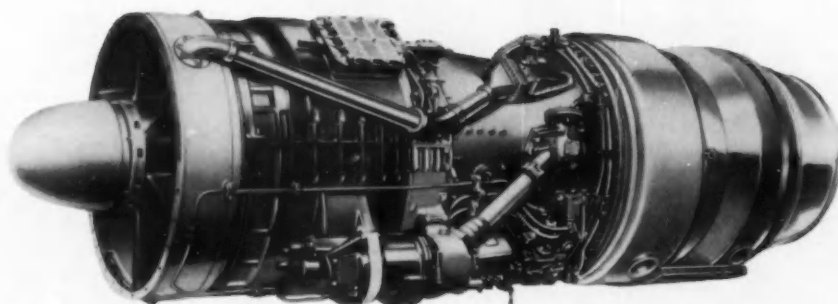
Rolls Royce offered a spectacular demonstration of reverse thrust used for jet braking with an Avon engine in a Hawker Hunter. Rectangular windows are cut in each side of the normal jet pipe about four feet



De Havilland's Gyron Junior is believed to have a thrust in the region of 10,000 lb. Of advanced design, it is smaller than earlier engines of half the power.



Latest edition of the Bristol Olympus, the B.01.6 rated at 16,000 lb thrust, has the highest power yet officially released of any British turbojet.



Details now released on the Rolls-Royce Avon RA.29 (right) give it a maximum thrust at take-off of 10,500 lb. Specific fuel consumption at sea level is stated to be 0.775 lb/lb thrust/hour—the lowest announced for any single-shaft turbojet. It weighs 3341 lb and is 125 in. long.

from the tail of the fighter. These openings, each carrying a row of forward-curved vertical louvers, are sealed off by clamshell shutters during normal flight.

For braking, the pivoted shutters are swung rearwards to uncover the openings and block the tail pipe. Efflux then exhausts sideways past the louvers which deflect it outwards and forwards. The resultant reverse thrust is stated to equal 50 pct of the basic power, and to reduce by half the usual landing run. This device will be used on the Comet IV, and for Conway engines which will power versions of the DC-8 and B-707.

The by-pass Conway, with 13,000 lb announced thrust, was again exhibited. The existence of the latest type, indicated as RCo-10, was disclosed, but no details are available. Rolls Royce also reported that the Avon RA-50 is now rated at 9100 lb thrust, and the RA-29 (which will power the Comet) at 10,500 lb.

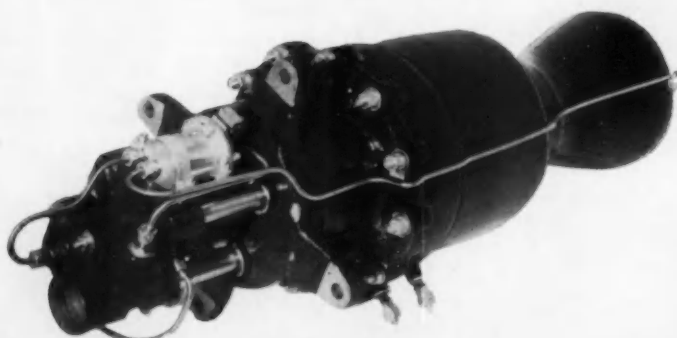
The RB.109, described in A.I. of December 1, 1955, had its first public showing, installed experimentally in the nose of a World War II four-engined Lincoln bomber. This turboprop of 4470 effective hp has been specified for the Vickers Valiant airliner. (Continued)

The Rolls-Royce reverse thrust system (below) installed in the tail of a Hawker Hunter fighter. When the jet pipe is sealed off and the side openings exposed, the efflux is exhausted outwards and forward to give effective braking.

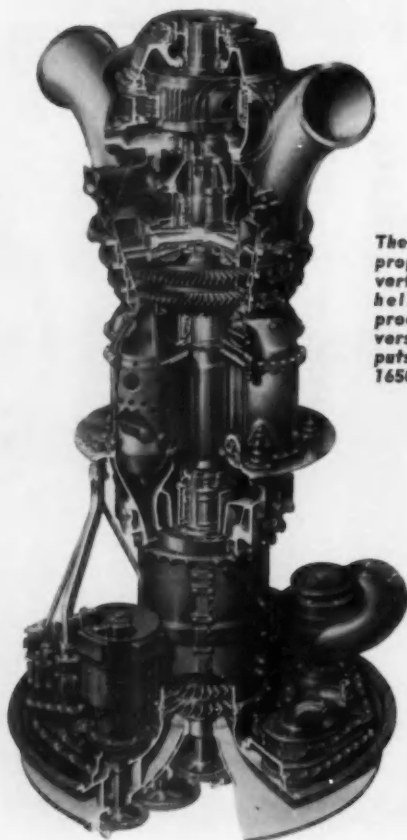




This ram jet test vehicle, exhibited by Napier, was designed and manufactured for Britain's National Gas Turbine Establishment.



The Napier NRE.17 liquid fuel rocket engine for missile propulsion has a thrust of over 2000 lb.



The Napier turbo-prop is designed for vertical mounting in helicopters. It is produced in several versions with outputs ranging from 1650 to 2000 shaft hp.

The fuel tank carrying hydrogen peroxide for the Napier tip jet installation is mounted above the hub of a helicopter rotor. Fuel is pumped through pipes in the hollow blades by centrifugal force.

The Napier offering in engines featured the Gazelle, a new turbine intended for helicopters. Similar to but smaller than the Eland, it is designed for vertical mounting under the rotor hub, although it can be installed and run at any angle. Basic layout comprises a free turbine with multi-stage axial compressor, annular combustion chamber, and independent compressor and power turbines. Final drive is taken through epicyclic gearing from the power turbine shaft, and there is no need for an overrunning or other type clutch when the rotor is auto-rotating or being started. Available in several versions, the 70-in.-long

Gazelle has ratings from 1650 to 2000 shaft hp. It will power the twin rotor Bristol 192 and the Westland S-58 Wessex.

As a helicopter assist unit, Napier presented a rocket-booster

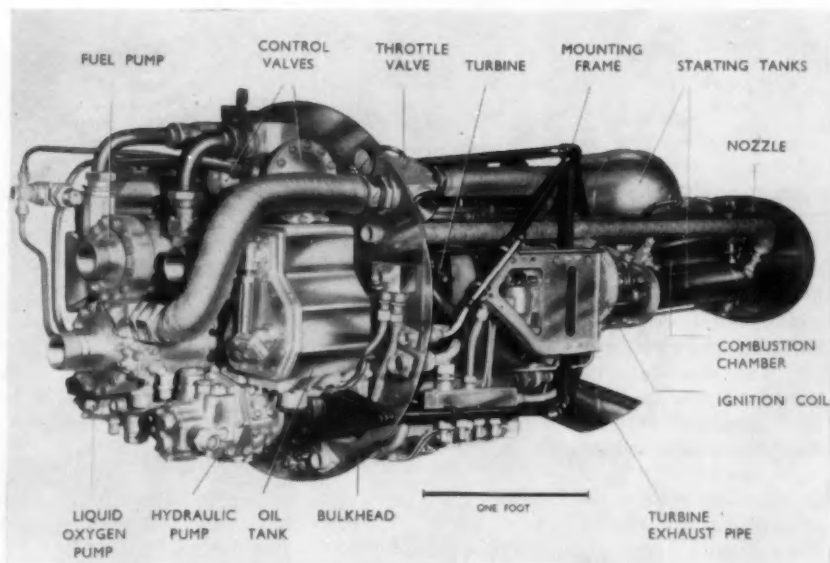


installation with jet nozzles fitting inside the rotor blade tips. Hydrogen peroxide is stored in a rotating tank mounted above the hub, and is pumped to the rocket motors by centrifugal force. There the liquid fuel is decomposed into superheated steam and oxygen by means of a catalyst. Thrust is instantly available and independent of atmospheric conditions, and greatly improves take-off performance and emergency power in the case of engine failure.

Napier developed the project in close collaboration with Saunders-Roe, and at Farnborough the system was demonstrated in a Skeeter light helicopter. Compared with a normal Skeeter, the rocket booster gave a climb rate of 1400 fpm against 230 fpm, and a hover ceiling in free air of 8500 ft against 1100 ft.

Intensive development of rocket engines has been undertaken by Napier for the past several years, and the air display gave the first glimpse of the new Scorpion in action. It was installed in the underbelly of a Canberra jet bomber which showed off the vivid power-assistance in flight, and the ease of extinction and relighting. High on the secret list, the Scorpion itself was not on view and the specially-prepared Canberra did not land at Farnborough.

Another liquid fuel engine from Napier, the NRE.17, intended for missile propulsion, is said to have a thrust in excess of 2000 lb. It is a development of the NRE.11 which has been successfully tested at the Woomera rocket range in Australia. This unit is lighter and more compact than its predecessor, and less than half the production time is required, as a result of



The Screamer rocket motor has a variable thrust ranging from 2000 to 8000 lb at sea level.

new developments in uncoded combustion chambers and exhaust nozzles.

The experimental NRJ.1, on which little information is available, is a ram jet engine for ramp launching. Initial acceleration to supersonic speeds is by booster rockets, after which it flies under its own power. Napier also exhibited a ram jet test vehicle of about 18 in. diameter which is launched by a cluster of eight rocket boosters around its rear. (Cont'd)



Two Fairey Fireflashes installed on a Hawker Hunter Fighter. They are guided to the target by riding a radar beam directed from the controlling aircraft.

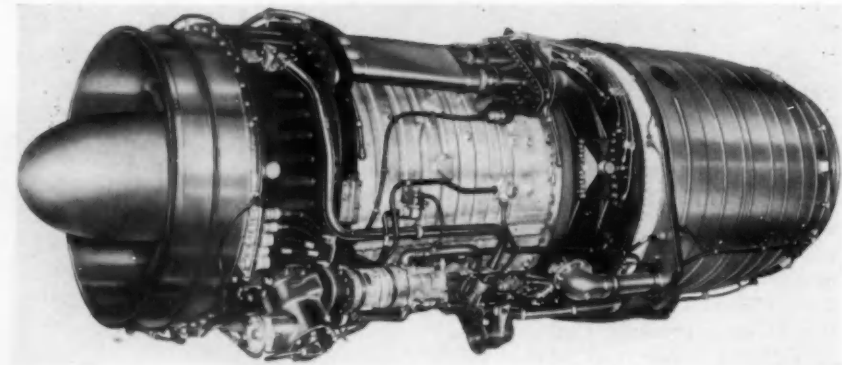
Fairey displayed its Fireflash air-to-air guided weapon, the first such missile to be produced in quantity for Royal Air Force. It is led to its target along a radar beam directed from the carrying fighter. The only data released are that the Fireflash is about 6 in. in diameter and 7½ ft long, with two external boost rockets that increase the total length to 9 ft 4 in.

Several units were seen at Farnborough, including pairs carried under the wings of Hunter and Swift fighters. It is claimed that these installations cause only a slight reduction in aircraft speed.

Bristol unveiled its Thor ram jet, a new power unit for guided missiles and aircraft. It has a double shock intake, cylindrical stainless steel body 6 ft long and 16 in. in diameter, and convergent-divergent propelling nozzle. Over 200 Thor-driven vehicles have so far been flown, and Bristol claims that these units accelerate from zero to more than 1000 mph in a few seconds, during which time they must light up and attain full power from a cold start. Heights of well above 50,000 ft are stated to have been reached. Bristol also displayed two early types of control test vehicles, with assembly details visible through transparent body sections.

Armstrong Siddeley's Screamer, an advanced rocket motor designed for use in piloted aircraft, features a variable thrust between 2000 and 8000 lb (at sea level) with single lever control for starting and stopping. Fuel is liquid oxygen and kerosene, sequenced to avoid explosion when starting. The 470-lb unit is 78 in. long with 28-in. diameter. The company's Super Sprite, first seen a year ago, was this time demonstrated in a Vickers Valiant bomber for a dramatic take-off assist. A pair of these 4200-lb thrust units was mounted under the wings with releases for parachute jettisoning after exhaustion. The Spectre was not shown, and is still under close wraps.

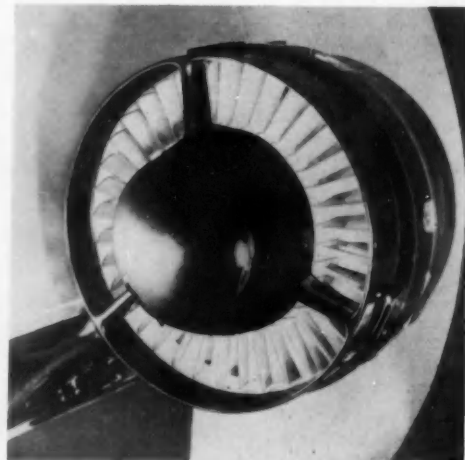
While no entirely new aircraft were exhibited, there were several improved or modified models. The Vickers Supermarine N.113 carrier-borne fighter-bomber, also designated as type 544, was seen publicly for the first time. Developed from the type 525 demonstrated in 1954, it is powered by a pair of Rolls Royce Avons, and features a mid-mounted wing with a saw-tooth leading edge swept at 45 deg, and an all-moving tail. Of special interest are the high-lift flaps using "super-circulation,"



The Sapphire Sa 7, made by Armstrong Siddeley, is now given a production rating of 11,000 lb thrust.



The 40-passenger Fairey Rotodyne with 90-ft rotor and stub wings will be powered by a pair of Napier Eland turboprops. It is expected to have an economical cruising speed of 150 mph.



The Plessey ram air turbine can be swung out into the air stream to provide emergency power in the case of component failure; used to drive either a hydraulic pump or electric generator.

MEMBERS of the Society of Automotive Engineers were told of the broadening applications of the farm tractor, and of some features of the redesign of the vehicle to meet these greater requirements, at the Annual Tractor Meeting and Production Forum at Milwaukee Sept. 10-13. This piece of agricultural equipment is being adapted to many industrial jobs. At the same time, a new hitch permits the user to

INCREASED TRACTOR VERSATILITY

Among Subjects at SAE Meeting

attach implements to the tractor more easily. Winterization of tractors for military or other service in very cold climates came in for attention also.

Tractor Conversion

Conversion of the farm tractor to an industrial machine involves, usually, the addition of a front end loader or a backhoe, or both, according to A. W. Acker, Henry Manufacturing Co., Inc. While the front end loader has been used on the farm for many years, the industrial loader must handle heavier loads at greater speed, dump into taller vehicles, and do continuous duty at tasks ranging from excavating to stockpile loading. It must also have a variety of attachments to meet materials handling requirements. The small hydraulically operated backhoe, recently developed, and a highly competitive item, is used by building contractors, plumbers, utility companies, municipalities, and cemeteries for all types of excavating.

The basic backhoe was designed as a quick, detachable self-contained unit, except for the oil reservoir and hydraulic pump. It can be attached to practically any tractor using a 3-point mounting which frequently employs a part of the tractor hitch system. The twisting moment around the rear axle caused by the weight of the backhoe is equivalent to approximately 2400 lb, suspended at 5 ft behind the axle. To prevent damage to the tractor transmission or torque tube, a sub-frame is used to transmit this moment to the front of the tractor.

Although one model backhoe can be used for most makes and models of tractors, it is impractical to design one loader that can be used on all tractors. Loaders can be operated from some tractor hydraulic pumps; a few tractors are now available that have special control valves which make it possible to operate the loader from the complete tractor hydraulic system. Generally speaking, however, the tractor hydraulic systems are not satisfactory for industrial loader operation because:

- (1) Pump capacity is too small or will not

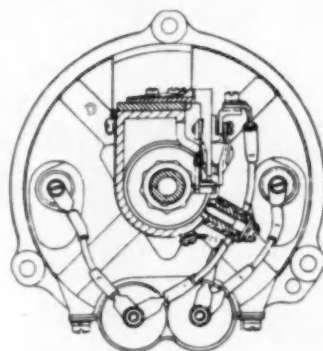
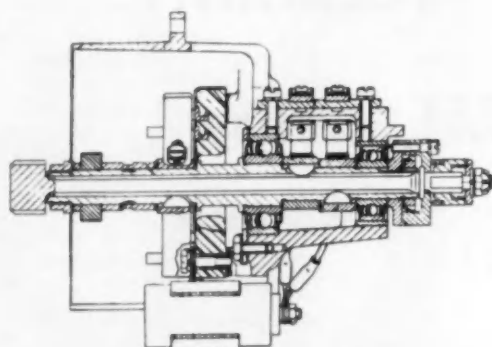
stand the higher pressure required for an industrial loader.

- (2) The oil reservoir capacity is inadequate to handle the displacement of larger loader cylinders and provide proper cooling of the oil. Usually there is no provision made to install an auxiliary reservoir.
- (3) The control valves are not suited for loader operation because they do not have good metering characteristics for precise control, do not provide dual control for both lift and bucket cylinders, or are not located conveniently for loader operations.

Very often the backhoe is mounted on a tractor in combination with a front end loader and the two units are operated from a common pump and oil reservoir. Due to larger displacement cylinders and faster operating cycle, the backhoe requires a larger pump than is available on the tractor hydraulic system. The loader that is designed specifically to be used in combination with the backhoe must have its hydraulic system designed around the same hydraulic pump. This loader would then operate very slowly on any tractor hydraulic system.

To obtain continuous hydraulic power necessary for loaded operation, the pump must be mounted ahead of the clutch. It is usually mounted on the front of the tractor and driven directly from the crankshaft at engine speed. There are several tractors in production today on which it is impossible to drive a pump from this location. Many others do not provide a good mounting surface to which the pump can be attached. Most manufacturers now have special power-take-off crankshaft pulleys available for their newer utility type tractors, but in many cases they are obtained only by special order. When it is impossible to use a front drive, the pump is driven from the rear power-take-off shaft. (Turn to page 108, please)

Service Problems Discussed at Bendix Aircraft Ignition Conference



By
Thomas
Mac New

Top timing flexible shaft distributor assembly for low tension ignition system on 18 cylinder engine.

DISCUSSIONS of jet engine ignition systems drew a great deal of attention from engineering personnel of the world's largest air carriers at the recent Bendix Aircraft Ignition Conference in Sidney, N. Y. As more and more airlines are ordering gas turbine equipped aircraft, the ignition experts were interested in obtaining essential facts relative to the operation and maintenance of such systems.

S. E. Gregoire, chief engineer of jet development at Bendix Scintilla Div., and R. L. Besser, Scintilla's supervisor of jet service engineering, gave pertinent information regarding the design, operation, and service of gas turbine ignition systems. Extracts from both papers are included herewith.

At this year's conference, there was very little said about high tension ignition systems for reciprocating aircraft engines as this type of ignition is slowly

passing out of the scene. A great deal of time was devoted to discussions of service on low tension ignition systems for reciprocating engines.

One of the new developments in the low tension ignition field is the flexible shaft top timing distributor. In this case, the distributor shaft gives a torsion bar action in that it has been designed to flex within its housing. Units are currently on test and awaiting the approval of engine manufacturers.

Scintilla engineers stated that the carbon brush distributor has been completely tested since last year's conference and that this unit should operate about 2500 hours without attention. A treated type brush and a special type finish on the segment and collector plate are also in the works.

Following are abstracts of two papers presented by their authors at the conference.

JET IGNITION SYSTEMS

By S. E. Gregoire
Chief Engineer, Jet
Scintilla Div.

BENDIX AVIATION CORP.

A GAS turbine ignition unit, sometimes called an exciter, is designed for intermittent duty. Although there are some requirements for continuous operation, they are for relatively short periods of time.

With few exceptions, ignition equipment is presently designed to comply with military specification MIL-E-5009A and occasionally, with variations thereof, to meet specific customer requirements.

Basically, Bendix makes two types of jet equipment for producing spark ignition: one is the inductive type

unit, the other the capacitance type.

In a typical inductive circuit, current from a 14 to 30 v battery passes through an ignition control switch, an input lead, a choke coil, in a suppressor and through a vibrator magnet winding, and the contacts of the

vibrator to ground.

If this ignition unit were designed to operate on a power source of 115 v ac, a transformer coil would replace the vibrator transformer.

The sparking frequency of the dc system varies from 200 to 400 cps depending on input voltage. Sparking frequency of the ac system varies from 350 to 420 cps, again depending on input voltage.

Capacitors on each side of the coil provide a low impedance path by which high frequency currents can be by-passed harmlessly to ground.

Noting the illustration, capacitor C3 has a dual purpose, in that it minimizes arcing and burning of the vibrator contacts, and also completes the circuit from L3 to ground. The voltage output is normally 15,000 and can be designed plus or minus that figure depending on requirements.

For dual ignition the components in the circuit would be doubled, with the exception of the suppressor.

Circuitry of the suppressor and transformer-vibrator in a high tension capacitance-type ignition unit is the same as described for the inductive type circuit. The secondary transformer coil, however, produces a lower secondary voltage which can vary somewhat for different applications. Current from the secondary flows through a rectifier and charges a capacitor.

The charge on the capacitor and the voltage at its terminals increase each time the vibrator contact points open until the potential reaches a given breakdown voltage of a spark gap. Upon the electrical breakdown of the gap a high frequency oscillatory circuit is completed.

At the initial flow of current through the spark gap and the primary of the transformer into another capacitor, an induced voltage appears across the secondary which is considerably higher at any instant than that across the primary and which increases at the same rate. Voltage output of this coil can vary from 10,000 to 25,000 v depending on application requirements.

A voltage thus appears across the electrodes of the igniter plug that rises very rapidly on a high fre-

quency wave form until electrical breakdown across the igniter plug electrode occurs.

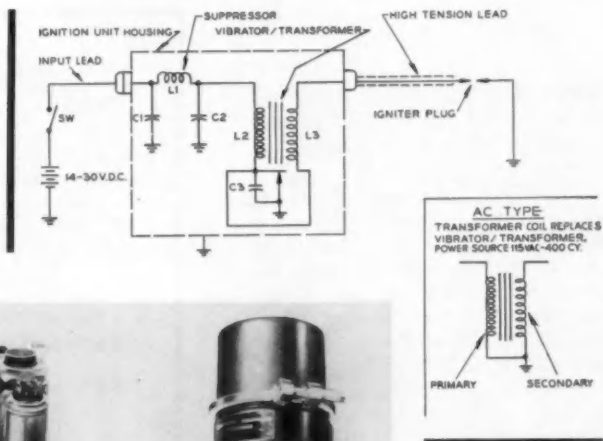
The igniter plug gap is now ionized, or we can say highly conductive, and the energy charge dumps directly across the gap in a brief but very high energy spark without a further step up in voltage. Practically all the energy stored is released at this time. Very little was needed for the initial high voltage-high frequency ionizing discharge which lasted only a few micro-seconds.

A resistor is used to discharge the final capacitor between sparks in or-

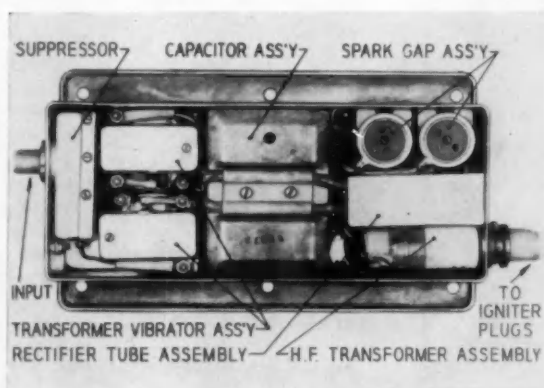
der that one side of the spark gap will be at ground potential and will require a constant voltage for breakdown. Thus the discharges will be more consistently effective.

The rectifier prevents the charge on the storage capacitor from leaking off between impulses.

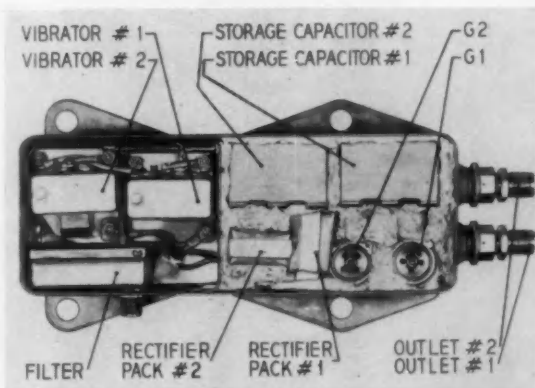
If the circuit were designed for a low tension type ignition unit, the suppressor, vibrator-transformer, rectifier, storage capacitor and the spark gap would remain in the circuit for the purpose previously mentioned. The high frequency transformer, the resistor and final capacitor would be



Inductive type ignition unit. Drawing above right is a schematic diagram of this type high voltage dc ignition unit



Dual dc high tension capacitance ignition unit assembly



Dual dc low tension capacitance ignition unit assembly

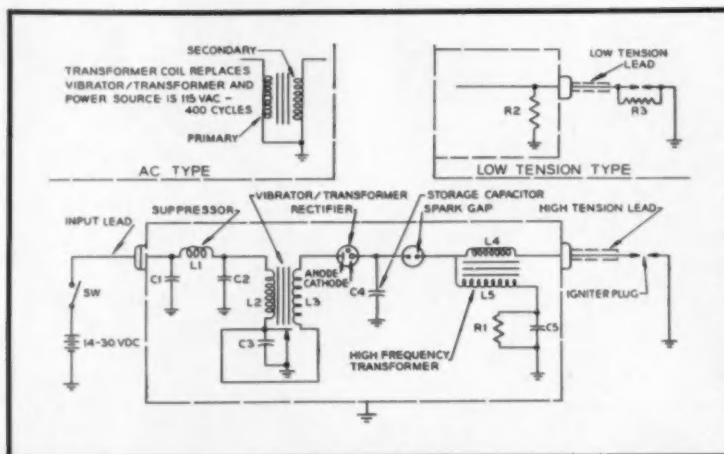
deleted and the circuit from the spark gap to the output terminal changed as shown in upper right hand view on the illustration.

Starting the description of this circuit with the electrical breakdown of the spark gap, a current flows from the storage capacitor through the spark gap, the low tension lead, and the shunted surface "ionizer" which bridges the gap of the shunted type igniter plug.

This current flow causes ionization of both spark gap and the igniter plug which permits the storage capacitor to promptly discharge through the spark gap, low tension lead and the igniter plug. High voltage does not appear anywhere in the system.

Another variation of capacitance ignition can also be made. If either the high tension or low tension type ignition units were designed to operate on a 115 v ac power source, then a transformer would replace the vibrator/transformer in the basic circuit.

Capacitance ignition units are rated by the joules of energy stored in the storage capacitor at the time

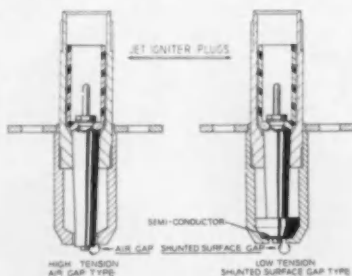


Schematic diagram of a capacitance type, high tension, dc ignition unit

RELATIVE VALUES ON WEIGHT & SPARK/SEC. VS ENERGY PRODUCED BY CAPACITANCE IGN. UNITS

Energy in Joules	Weight in Pounds	Average Spark/Sec. @ 24V-D.C.
.50	2.00	8
1.00	2.50	4
3.00	4.50	3
6.00	5.75	2
12.00	7.50	1
20.00	10.50	1

Values specified are approximate and based on single circuit designs. For dual unit weight, add approximately 75% of the figures shown.



High and low tension jet igniter plugs

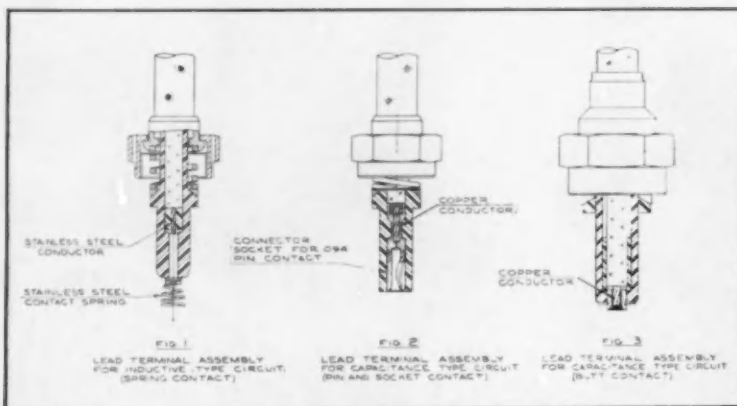
the spark gap breaks down and can vary from approximately 0.5 joule for small turbine applications to 20 joules or more for larger engines.

Jet igniter plug leads are designed in most instances with end fittings for the $\frac{3}{4}$ in. high altitude terminal.

A conventional type of conduit is used to protect the conductor cable from mechanical abrasion and radio interference radiation. The terminal connection at a jet engine igniter plug is subject to higher temperatures than encountered for a similar type of junction on a reciprocating engine and suitable materials are used for insulating against such adverse effects.

Leads for inductive type systems can use stainless steel conductor cables with stainless steel contact springs of the type used for reciprocating engines. It is absolutely essential, however, that leads for capacitance type systems have a copper conductor cable and a substantial amount of contact area at the connecting junctions, such as at the igniter plug and ignition unit. The reason for this combination is to provide a path of minimum resistance for current discharges from the ignition unit and thereby minimize losses of output energy at the igniter plug.

Ignition units designed for high altitude operation are hermetically



Jet igniter plug leads for inductive and capacitance type circuits

sealed to maintain ground level atmospheric pressure within the assembly. This feature permits designing for stable voltage flashover to ground conditions which otherwise would vary in proportion to the reduced atmospheric pressure at various altitude levels. The sealing feature is accom-

plished by soldering the cover on the assembly and around external screws or bushings that penetrate into the housing. The maximum temperature the ignition assembly will encounter in service is lower than the plastic state of the solder used. For temperatures above 350 F, the junctions

that require sealing are arc welded to a material penetration depth of approximately 0.016 in. which can be machined off with a belt type sander. Such junctions are designed to permit the arc welding removal for overhauling the assembly approximately five times.

SERVICE OF JET IGNITION UNITS

By Robert L. Besser
Scintilla Div.

BENDIX AVIATION CORP.

FOR proper service, the following tests should be applied to the majority of ignition systems in jet installations. The first is a measurement of input current which should be a relatively stable value. A visual observance of the spark at the igniter plug is most helpful.

The next factor which is most important is the spark rate. This is a demand requirement established by the components within the ignition unit. With the vibrator operating at proper efficiency, it takes a certain time for the voltage to build up on the tank capacitor. The limiting factor as to the maximum voltage on the tank is the breakdown voltage requirement of the gap. Even though the spark rate is at a normal value there is no assurance whatsoever that the energy being dissipated at the plug is proper and as intended. Therefore, the relative value of the energy stored at the tank must be determined. At Scintilla, the ignition unit is fired under relatively normal conditions and the peak voltage that is applied at the discharge is measured. The indications on the test units do not measure the voltage across the gaps nor the peaks, but do measure the true tank charge.

At the present time it is recommended that the vibrator be subjected to a test on a simple breadboard circuit. In the maintenance of vibrators, sealed vibrator heads are provided on some systems while another type, called a chopper, is of the throw-away variety.

The new Scintilla tester for jet ignition systems can very readily test high frequency transformers. With the tester the tank capacitor is charged and discharged under oper-

ating conditions. It checks the ability of the ignition system to fire a test gap at a known tank voltage of the test circuit. This same tester will test the breakdown of gaps.

Igniter plug leads should be checked for continuity and breakdown. Present recommendations are that 15 kv be applied to high voltage leads and that 500 megohm minimum resistance exists. On low voltage leads, five kv is the recommended breakdown value with 250 megohms minimum resistance. For checking input leads, continuity and leakage, testing at 1000 v dc is recommended.

On low tension plugs, the continuity between the input terminal and the center electrode should be checked. Then a breakdown voltage or an ionization requirement determination is

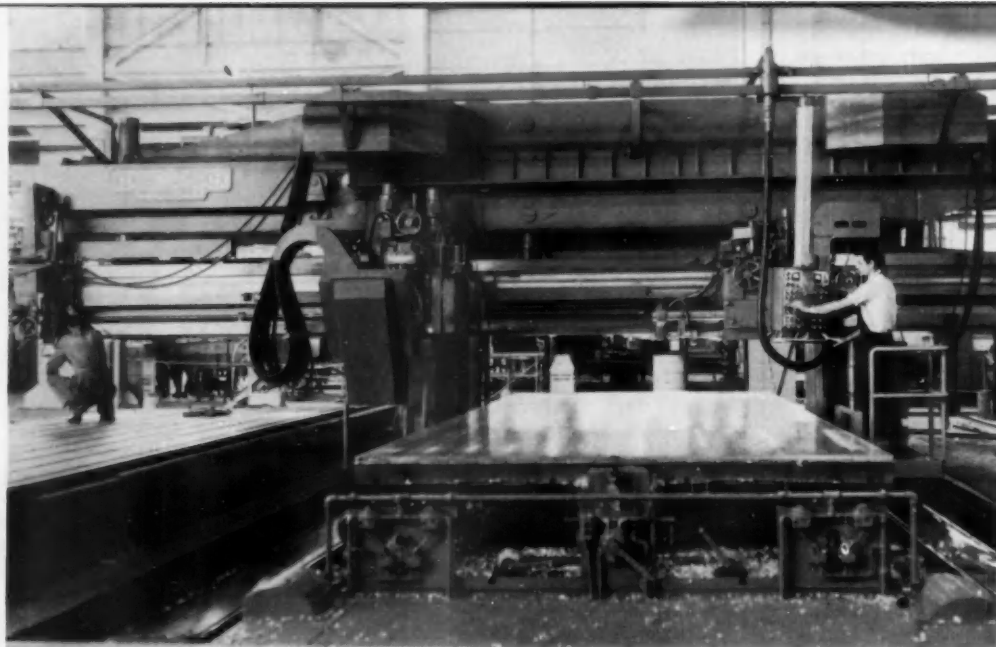
necessary. The maximum voltage that these low tension plugs should ionize at is in the range of 1000 v. Usually, they fire from 300 to 500 v—with some a little higher. Scintilla suggests that high tension plugs be tested as follows: Quench the discharge in a dielectric solution, then subject the center electrode to 15 kv potential. Leakage resistance should not be in excess of 500 megohms.

In the discharging of all ignition systems, it is recommended that these discharges be performed inside or under an enclosure and, in many cases, due to the brilliancy of some of these discharges, a safety filter glass should be used. This feature has been included in the new Scintilla tester.

The amount of ignition test equipment required for jet engine systems will not equal that which is currently utilized for reciprocating engine systems. Electronics, no doubt, will play a big role in future servicing of jet ignition systems.



New Scintilla test stand for gas turbine ignition components. This stand will handle all type of systems.



The new 200-ton skin mill, showing operator at electronics controls to guide the 70-ton head and gantry holding the cutting tool. Work table with aluminum cover is underneath, with template table at left.

Canadian Plant Installs 200-Ton Skin Milling Machine

BY JAMES MONTAGNES

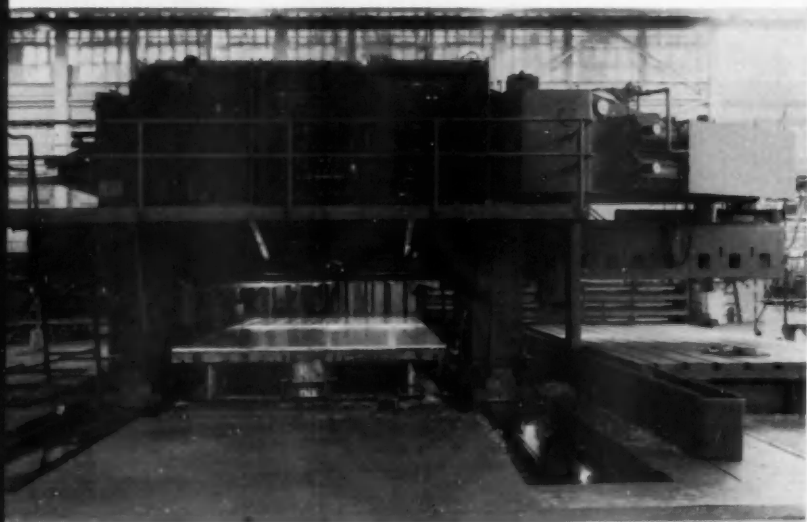
THE largest skin milling machine in operation in Canada began work in mid-September at the Avro Aircraft Ltd. factory near Toronto, to make wing sections for the new delta-wing supersonic fighter CF-105 being built for the Royal Canadian Air Force. It was built for Avro Aircraft to its specifications by the Kearney and Trecker Corp., Milwaukee.

The skin mill is one of a number of large new machines installed at Avro Aircraft for the manufacture of the CF-105. It is considered the most versatile in its field and is believed to be capable of carrying out any skin milling work on aircraft designs of the foreseeable future. With the advent of the supersonic era the skin mill has become increasingly important. It carves complete sections of aircraft wing skins and their stringers or ribs out of solid metal.

Because there are considerably fewer rivets required in the finished wings by using this method, the wing is much stronger and the wing skin much smoother.

Basically this is how Avro Aircraft's new mill operates: Alongside the 28 ft by 9 ft work table is another table on which the metal pattern template is placed. A stylus is

(Turn to page 120, please)



The electrical relays, etc., of the new 200-ton skin mill are located in cabinets with work table underneath and template table at right.

AUTOMATION NEWS REPORT

AUTOMATIC CONTROLS
PRODUCTION — VEHICLES — AIRCRAFT

By Samuel Cummings

STORAGE TOWERS

With the addition of the new Gear-O-Mation storage towers to an automated production line, it is no longer necessary to shut down the entire line in the event that one machine goes down. The towers, which also act as production stabilizers, were developed by Gear-O-Mation Div., Michigan Tool Co.

The storage towers are placed between machines, and thus become an integral part of the line. They consist essentially of zig-zag gravity feed tracks and parts elevators, arranged so that they receive a floating and continuously moving bank of parts from one machine, which are then fed as needed into the following machine. The number of parts in a floating bank may vary anywhere from several hundred to more than 5000, depending upon the amount of time required to make tool changes in the machines on either side of the storage tower. When a machine goes down, the tower that feeds the machine merely adds parts produced by the preceding machine to its floating bank. At the same time, the tower on the other side of the disabled machine releases parts previously stored in its floating bank to the next machine in the line.

The storage towers can also be used to level out operation of all machines in an automated line, a difficult operation even under normal conditions. By means of the floating banks, individual machines can be operated at their maximum efficiencies for planned production periods without being limited by what the machine ahead or behind is turning out. For example, a machine with a high output rate can be operated on a one-shift basis, while the machine next to it with a longer machining cycle is operated on a two-shift basis; or a machine can be run for portions of one shift while others are operated full time. This enables the user to exercise a wider choice of equipment when setting up an automated operation. (See illustration)

INCHWORM MOTOR

Airborne Instruments Laboratory, Inc., has developed a new machine-tool control device, called the Inchworm, which controls a tool's cutting edge so precisely that parts can be ground to an accuracy of five millionths of an inch. The Inchworm is aptly named;

it actually moves along in microinch steps (one millionth of an inch), expanding and contracting. The device utilizes an effect known as magnetostriction, which works as follows: The nickel rod or armature of the Inchworm motor shrinks under the influence of the magnetic field, when electric current is applied, and snaps back to original size when the magnetic field is de-energized. A pair of clamps attached to the armature convert these expansions and contractions into forward or backward motion, reversing on demand without backlash. In its first application, the new linear actuator has replaced conventional lead screws in centerless grinders.

HIGH-TEMPERATURE ELECTRONICS

Electronic devices and circuits that can withstand the blistering temperatures generated by guided missiles, satellites, and supersonic aircraft were demonstrated recently by General Electric Co. scientists and engineers. Among the components tested were G.E.'s new vacuum tubes, capacitors, resistors, transformers, inductors, wires, printed circuit boards, all of which operated efficiently in electric furnaces at temperatures ranging from 900 to 1500 F. A conventional electronic assembly subjected to the same searing heat would stop working immediately and quickly disintegrate into a puddle of metal and glass.

The new high-temperature circuits were developed



Gear-O-Mation stabilizing tower, shown here, is capable of handling a mobilized storage of 600 blanks with a 4-in. diam and 1-in. face width in its four banks of zig-zag track

at the G.E. Electric Laboratory, at Schenectady, N. Y., in cooperation with other G.E. divisions and various U. S. defense agencies. Metals such as titanium and special laboratory-designed ceramics played an im-

(Turn to page 117, please)

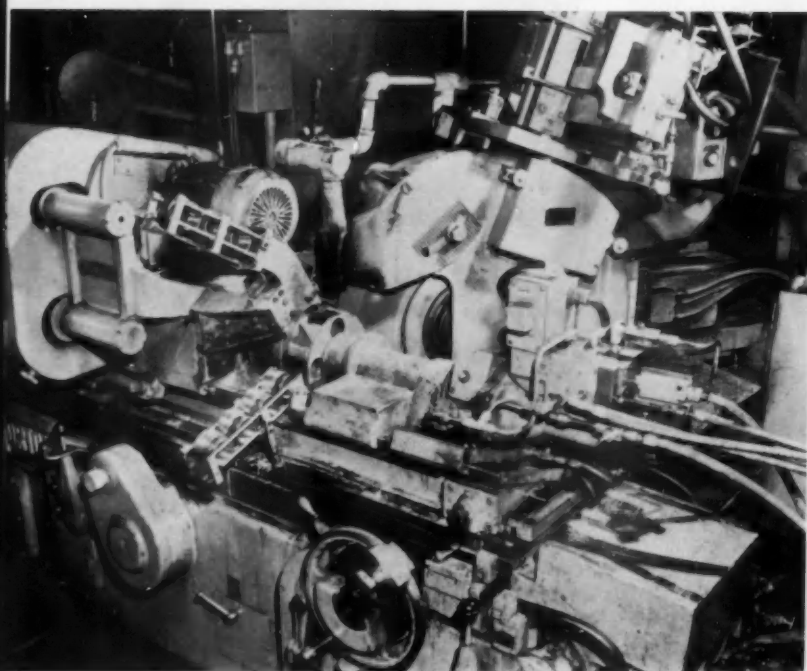
Unique Setups for Grinding Machines

in

Transmission Plant



VIEW at left looks down on one of a battery of five Norton CMS-1 semi-automatic, multi-wheelslide grinding machines in operation at the Detroit Transmission Div., General Motors Corp. plant at Willow Run. The problem here is to grind two cone surfaces on the periphery of the part, holding the angle on each side to 13 deg plus or minus two minutes. As illustrated, the operation is performed with two wheels set at the proper angle, finishing the piece in the time it formerly took to grind just one taper. The operator uses the Sheffield gage in the foreground to check both size and diameter within stated limits.



HERE is an example of fully automatic loading and unloading of a Norton angular wheel slide grinder. One of a number of similar grinders used at the Detroit Transmission Div., this machine handles finish-grinding operations on the rear clutch drum sleeve which may be seen in the chutes. The machine is completely automatic, and requires only hand loading of the top chute. The operation is to finish-grind the body OD, finish-grind two lands of smaller diameter, and grind a face. This is done by means of two grinding wheels on the angular head. Once correct size has been established, the machine will continue operating automatically, dressing for size as wheel wear occurs.

THE use of Teflon reduces the number of manufacturing operations and the number of components required in the manufacture of shielded spark plugs by the Jet Ignition Co., Larchmont, N. Y., which is substituting Teflon thinwall tubing for ceramic sleeves in shielded spark plugs for aviation and combat vehicle use.

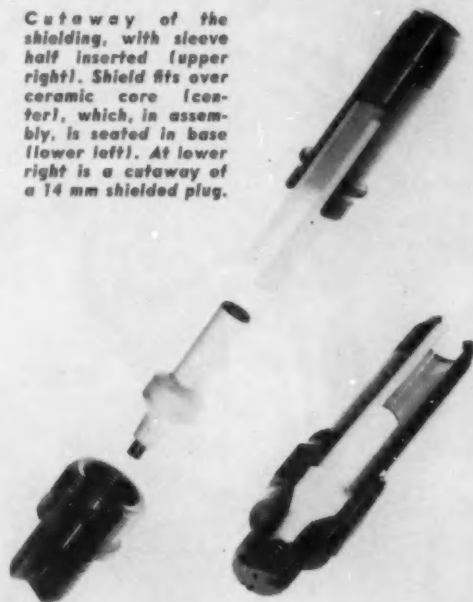
The same shielding design is used both in aviation to maintain at high altitudes the ground-level atmosphere pressure, and in tactical combat vehicles prevent enemy forces from detecting the presence of the vehicles through radio receivers.

The shield consists of a metal cylinder, lined with a sleeve, that encloses the top part of the ceramic core of the plug. The core, including the top electrode, extends approximately halfway up the tube which is sealed at the top.

Despite the fact that ceramic sleeves are fragile and rigid—disadvantages in this application—no satisfactory substitute for ceramics had been found until Jet Ignition collaborated with Raybestos-Manhattan, to adapt Teflon thinwall tubing to this use.

Ceramic of almost pure (96 per cent) aluminum oxide was the only material that had the high dielectric strength and the high-temperature resistance and

Cutaway of the shielding, with sleeve half inserted (upper right). Shield fits over ceramic core (center), which, in assembly, is seated in base (lower left). At lower right is a cutaway of a 14 mm shielded plug.



Improved Sleeves for Shielded Spark Plugs

at the same time was impervious to moisture and corrosion. Substitutes for ceramic that were satisfactory in some of these qualities lacked others.

Although the ceramic sleeve had all of these essential qualities, its disadvantages were: breakage in handling during manufacture ran as high as ten per cent; tolerance limits available (± 0.010 in. OD; ± 0.010 and -0.000 in. ID) were not exact enough, if sleeves were at either extremes of the limits, to assure the sleeve's clearance of the ceramic core; and rigidity of the ceramic sleeve required a gasket at both ends and metal flanges crimped over the gaskets to hold them and the sleeve in place.

Teflon thinwall tubing, with all of the essential qualities, has none of the disadvantages of ceramic sleeves. It has a high dielectric strength, will withstand operating temperatures as high as 800 F, has zero moisture absorption and is impervious to corrosion and chemical attack.

Tolerances on the Raybestos-Manhattan thinwall Teflon tubing that Jet Ignition uses are ± 0.005 in. on both OD and ID, substantially closer than ceramic tolerances.

Although the initial cost of the Teflon sleeve, itself, is about twice that of the ceramic sleeve, the reduction in manufacturing expense is said to more than compensate the price difference.

There is no loss from breakage with these sleeves,

and they require neither the gaskets nor the crimped flanges. Therefore they afford a saving in both material and labor in plug manufacture. The Teflon thinwall tubing comes in coils which may be cut to length, rather than as individual ceramic sleeves.

In assembly, the Teflon sleeves, because of their slippery surfaces, are easily inserted in the shield, and their flexibility permits them to accommodate, without cracking or breaking, any irregularities of shape or dimension in the ceramic core of the plug.

To the consumer, the principal importance of the new sleeve lies in the toughness of the material. If a plug with a ceramic core is dropped, the ceramic may crack, permitting the spark to arc through the crack to the wall of the shield rather than at the spark gap. When such plugs are dropped, they must be tested for cracks before being installed, and discarded if the shield is cracked. Plugs with Teflon sleeves can be dropped without damage to the sleeve.

In aviation applications, the possibility of damage from dropping is not a one-time but a recurring problem. Each time aviation plugs are removed and inspected there is possibility of plugs being dropped.

The shielded Jet Ignition plugs have been certified by the C.A.A. for two aircraft engines: the Wright 1820 in 1955; the Franklin aircooled engine (used in the Bell Helicopter) in early 1956. In tactical vehicles the plugs are used in Venezuelan army tanks.

PREVIEW... of the METAL SHOW FOR '56



A RECORD 465 exhibitors will display their products at the 38th National Metal Exposition and Congress to be held in Cleveland from October 8 to 12. The displays will be housed in Cleveland's huge Public Auditorium, which contains over 250,000 sq ft of floor space. Many of the items on exhibition are described in the following pages.

Officials of the American Society of Metals, sponsors of the Metal Show, predict an attendance of more than 45,000, as compared with the total of 39,701 who attended the 1955 conclave in Philadelphia.

The accent of this year's show will be on the cost-cutting economies of the new equipment. "Greater efficiency in operation means only one thing—greater production savings," explains W. H. Eisenman, General Manager, and National Secretary of the ASM.

All sessions of the National Metal Congress, which will include the presentation of more than 150 technical papers, will be held at the headquarters of the four participating technical societies, as follows: American Society for Metals—Statler Hotel; Institute of Metals Division—Hotel Carter; American Welding Society—Hotel Cleveland; Society for Non-Destructive Testing—Hotel Hollenden. Two other societies—the Special Libraries Association, Metals Div., and the Industrial Heating Equipment Association—are holding sessions concurrent with the Congress.

The ASM will hold its annual seminar, before the

show gets officially underway, on Saturday and Sunday, October 6 and 7. Subject of this year's seminar, "Creep and Recovery," will be covered by a total of 13 papers. Highlighting the seminar will be a talk, at the Saturday evening session, by Dr. E. N. da C. Andrade, former director of the Davy-Faraday Laboratory and Honorary Librarian of the Royal Society, London. Dr. Andrade's subject will be "The Concept of Creep."

Among the technical sessions having more than ordinary scientific significance will be a one-day conference on thorium metal, which will be held October 11 and is jointly sponsored by the Atomic Energy Commission and ASM. Presiding at the morning and afternoon sessions of conference will be four distinguished scientists: Drs. F. H. Spedding and H. A. Wilhelm, Director and Associate Director, respectively, of the Institute of Atomic Research, Ames Laboratory, Ames, Iowa; and E. Epremian, Chief, Metallurgical Branch, Div. of Research, and R. Carson Dalzell, Assistant Director, Engineering Development Branch, both of the U. S. Atomic Energy Commission of Washington. The conference, one of the first of its kind, will present 22 talks by men prominent in the atomic-nuclear field.

Another feature of the technical sessions will be a series of lectures on the factors affecting the fatigue endurance of carburized steel to be given by staff members of the Metallurgy Section of the new General Motors Research Center on Thursday, October 11 at the Statler Hotel. After an introductory lecture by J. B. Bidwell, which will include a brief review of the actual state of knowledge of the effect of carburizing on residual stress, G. H. Robinson will discuss the "Physical Metallurgy of Carburized Steels." The afternoon session will be given over to lectures on the "Residual Stresses in Carburized Steels," by W. S. Coleman, the "Fatigue Durability of Carburized Steels," by R. L. Mattson, and a summary by R. F. Thomson.

Beginning Monday, October 8, through Thursday, the ASM will hold morning and afternoon sessions. The AWS will hold its first session on Monday afternoon, October 8, and will continue with morning and afternoon session through Friday. The Institute of Metals Division and the Society for Non-Destructive Testing will hold morning and afternoon sessions, Monday through Wednesday.

(Turn to page 114, please)

What's **NEW** at the

National Metal Show

CLEVELAND

October
8-12

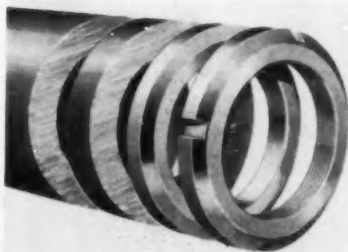
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Ball Sets, Bearings

In addition to a diversified line of precision balls, sets of high-precision stainless steel tooling balls used as reference points in jig and fixture work, will be shown. Another new product line is a complete range of Teflon balls for applications requiring resistance to caustics and acids. Also to be exhibited are custom anti-friction bearings for special requirements of high temperature, corrosion-resistance, non-magnetic properties, and configurations. *Industrial Technologies, Inc., Booth 2517.*

Circle 25 on postcard for more data

Seamless Steel Tubing



Depicted is the manufacture of locknuts from NP-60 seamless steel tubing, a new material to be introduced at the show. Increased production rates resulting from free machinability obtained by a special manufacturing process is featured. It is available in the lower carbon range (up to AISI C-1025) of seamless steel tubing. (Ohio Seamless Tube Div., Copperweld Steel Co., Booth 311)

Circle 26 on postcard for more data

Degreaser

In operation will be a complete unit incorporating various phases of degreasing. The machine has been especially designed for demonstration purposes and shows the results obtained with any single type of degreasing or combination of methods, including vapor, vapor spray, liquid immersion and vapor rinse, double

liquid immersion followed by vapor rinse, or liquid immersion, spray and final rinse. Improvements in cleaning through ultrasonics can also be shown. The unit incorporates ultrasonic transducers of 144 sq in. While this machine combines various methods to demonstrate the results obtainable from any one of these methods, the company states it is commercially usable and available to manufacturers requiring a flexible unit. *G. S. Blakeslee & Co., Booth 1019.*

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Stainless Steel Parts

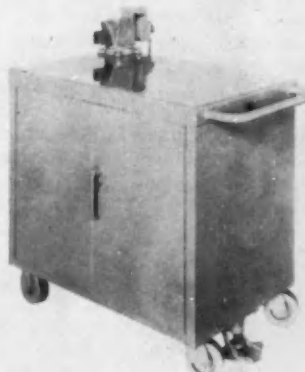
Some of the interesting items contained in an exhibitor's display will include piston ring expanders and radiator parts made from stainless steel. The company reports these parts will be used for the first time on a number of 1957 cars.

Tool steels, electrical steels and cemented carbide products will also be displayed. *Allegheny Ludlum Steel Corp., Booth 451.*

Circle 28 on postcard for more data

Mobile Workbench

This portable workbench, recently developed, will be on display. The interior is fitted with three shelves, a drawer and a large area for tools. It is fabricated of



$\frac{1}{8}$ and $\frac{3}{16}$ -in. steel plate, will support 2000 lb on the $\frac{3}{16}$ -in. top, and can be moved easily by one man. The Roll-A-Bench weighs 325 lb, and is 34-in. high, 41-in. long and 26-in. wide. Table top is 24 by 36-in. (The Overbeke-Kain Co., Booth 2620)

Circle 29 on postcard for more data

Application of Oxide Coatings by Spray Method

An actual demonstration of the application of Rokide spray coatings will be the highlight of one exhibit. Company operators will show the ease with which these new oxide coatings can be applied to a variety of base materials as a protection against the effects of high temperature, abrasion, erosion and corrosion, and to provide electrical insulation. These coatings have found application in the field of rockets and jet propulsion. (Norton Co., Booth 2414)

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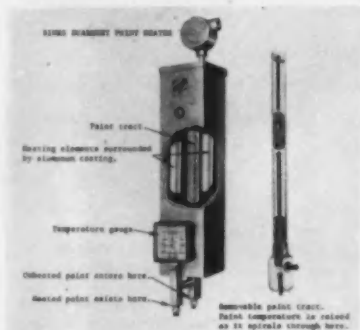


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Paint Heater

To be displayed is a new series of paint heater called the Dualheat which features a removable paint tract to facilitate servicing and inspection. Other stated advantages are lower operating cost, simple installation and easy operation.

The paint tract is the heated chamber within the unit where the temperature of the paint is raised. It is said there are no parts within this chamber that will be affected by the intense heat, thereby eliminating many causes of paint heater failures. Periodic inspection of the paint tract



Binks Dualheat paint heater

can be made by removing it from the unit, and complete replacement can be done in less than five minutes.

Installation of the compact unit is said to be simple because it fits easily into existing cold spray process systems either as a portable or stationary unit. Since electricity is the source of the temperature-raising energy, there is no need for specially-engineered, space-consuming auxiliary units.

The heaters are available in two basic models. The heavy-duty unit is capable of raising paint temperatures to between 160 and 180 deg at the rate of 15 gph. UL approved, it operates on either 220 or 110-v. The standard heater is designed to raise paint temperatures to between 160 and 180 deg at the rate of 8 gph. This unit operates on 110-v. Both models feature sensitive and adjustable thermostats and they can be installed on the wall of a spray booth. Refinements on both

models adapt heated air controls and recirculating systems for varied applications where it is difficult to maintain a constant paint temperature. *Binks Manufacturing Co., Booth 2755.*

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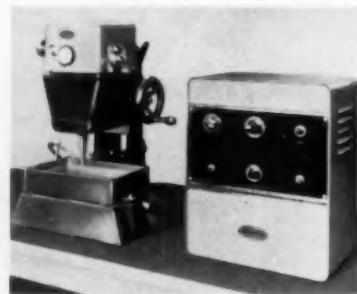
Grinder, Weldpliers

Two new industrial products, a low-powered and a high-powered ultrasonic impact grinder and weldpliers, will be among the exhibits in one booth.

The ultrasonic impact grinder is said to provide greater flexibility over conventional machining methods on hard or brittle materials such as ceramics, metals and semi-conductors. Made in a low-powered bench-type model and a high-powered floor-

mounted model, it is reported to be capable of faithfully reproducing intricate shapes and designs by slicing, drilling, engraving, shaping and finishing.

The light-weight, hand-held weldpliers are designed for production line applications on small parts and assemblies. Water-cooled electrode holders are employed for inputs to

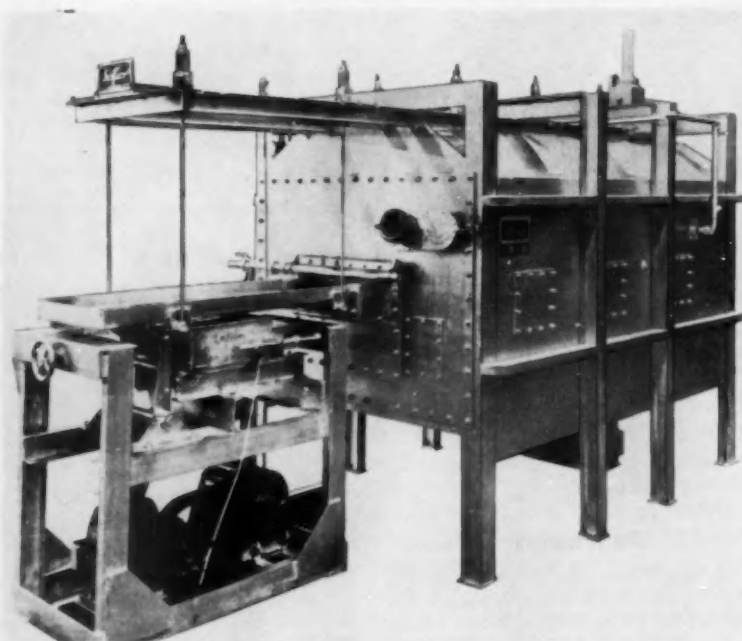


Raytheon ultrasonic impact grinder

five kva with a-c power supplies, or 600 w-sec with d-c stored-energy supplies. *Raytheon Manufacturing Co., Booth 2848.*

Circle 32 on postcard for more data

Heat Treating Furnaces and Equipment



The feature of one exhibit, which will have as its theme equipment for heating metals from "ingot to the finished product", will be this new snap hearth furnace, utilizing protective atmosphere. The display will emphasize a large variety of equipment for any size heat application, including complete plants and automated production lines. *(Surface Combustion Corp., Booth 421)*

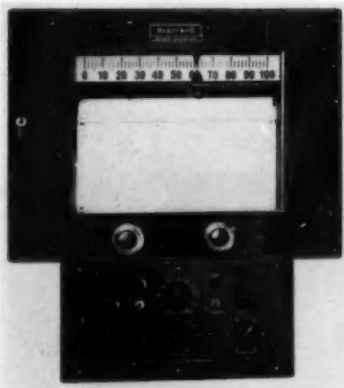
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Industrial Instruments

An exhibitor will display its latest instrumentation for metal processing in four operating panels. Featured are the new ElectroniK Special Class 14 line of instruments; new control systems for saturable reactors; horizontal and vertical case Pyr-O-Vane controllers; and Radiamatic radiation pyrometers.

Pyr-O-Vane and Protect-O-Vane (vane type millivoltmeter pyrometer) controllers will be displayed on the first panel. This exhibit will stress economical, reliable temperature control and the variety of control actions available. Mounted below these instruments will be examples of various plug-in control units, including on-off control, excess temperature cut-off control, three zone control, and pulse type time-proportioning control.

The second panel will feature two control systems for saturable reactors. One system comprises an ElectroniK instrument and a newly-developed three mode current proportioning control unit. As minute



ElectroniK recorder-controller

temperature variations occur in the process being controlled, they are immediately detected by the instrument which in turn decreases or increases its output signal. This signal goes to a magnetic amplifier which boosts it sufficiently to operate the saturable reactor and increase or decrease the amount of current to the process heating equipment. The second system, known as the "three mode power proportioning system," is similar in its function but operates a motor-driven auto-transformer through a three mode position proportioning control unit to vary power to the saturable reactor. The exhibit will be so arranged that visitors can switch either system into a circuit to

Automatic Precision Flat Lapping Machine

Called the GYRO-Matic "21", this flat lapping machine, coupling pushbutton operation with precise finishing, will be exhibited. Piece parts positioned in laminated thermosetting plastic nests are keyed into gear retainer rings on lapping plate. Weights designed to impart uniform pressure are placed over the parts to be lapped. After initial pilot run, timer is set for automatic stopping for correct length of lapping time. Optical flatness to one light band is said to be obtainable. (Spittfire Tool Co., Booth 2550)

Circle 34 on postcard for more data



control the temperature of a miniature electric furnace.

The new line of ElectroniK recorders and controllers occupies the third panel. This Special Class 14 line is designed for applications that do not require the full precision and accuracy of the Precision Class 15 line, yet retains its dependability at a lower price. The Special Class 14 line is available with either electric contact or proportional control in a single record strip chart, circular chart, or circular scale models.

The fourth panel will display Radiamatic radiation detectors. These units, which sense temperature by radiation, are used for measurements between 32 and 7000 F on large or small areas, on moving or rotating targets, or where vibration, shock or corrosive atmosphere prevent the use of a thermocouple. Minneapolis-Honeywell Regulator Co., Booth 312.

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Processed Steel Plate

A demonstration of mechanized flame-cutting of plain and irregular shapes from steel plate, employing the electronic eye tracer, plus a machining operation performed on E-Z-Cut steel plate, will be features of an exhibit.

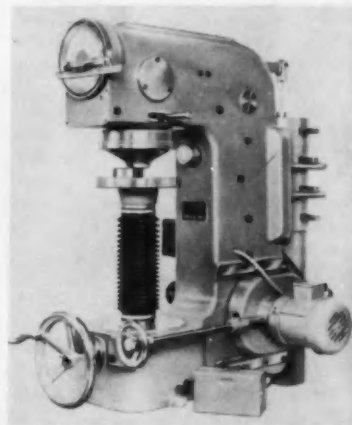
E-Z-Cut steel plate is the company's newest leaded steel, suited for making die bases, jigs, molds, and other products in which considerable machining is involved. The machining operation will demonstrate the

improved machinability of this steel plate over steel plate without the lead addition.

The mechanized flame-cutting equipment with the electronic eye tracer is said to permit faster, more accurate and more intricate sketch burning. Joseph T. Ryerson & Son, Inc., Booth 405.

Circle 36 on postcard for more data

Hardness Tester



On exhibit for the first time will be this motorized 3000 kg reflex hardness testing machine with Carl Zeiss automatic projection system showing at each test cycle the diameter of the ball impression magnified 20 times. Test cycles are adjustable from 6 to 60 sec each. In routine production tests the operator is guided by simple limit stops on the projection screen. (Gries Industries, Inc., Booth 550)

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National Metal Show

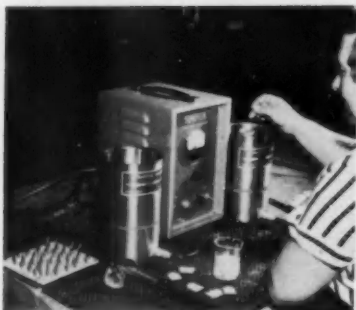
CLEVELAND

October
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Small Parts Cleaner

To be shown is a new ultrasonic cleaning apparatus, Model AP-10-B, designed for bench-top operation in the washing of delicate, intricate parts that must be "surgically" clean, such as instrument components, small



Branson AP-10-B ultrasonic cleaner

bal-bearings, etc. It comprises a 36-40 kc power generator, and a cylindrical cleaning tank, with transducers hermetically sealed into the base. Tanks are of one-pint, one-quart, or ½-gal capacity, giving a maximum effective cleaning area of 24 sq in. Two of the smaller tanks may be operated simultaneously, and two of the larger tanks alternately, depending on tank size specified.

Cleaning is effected by ultrasonic activation of the solvent, which literally blasts soils away from the surfaces to be cleaned. However, the ultrasonic "scrubbing" is said to be so gentle that it cannot harm even the most delicate components. The cleaning action reaches all surfaces accessible to the fluid, even blind holes, complex geometry, and those areas almost impossible to clean by conventional methods, it is further stated. Branson Instruments, Inc., Booth 2145.

Circle 38 on postcard for more data

Gear Hobber, Testers

Shown in one booth will be a high-speed universal gear hobbing machine, type CIMA P3, with differential attachment for simplifying the cutting of helical and spiral gears, and with tangential feed for cutting

worm gears and worms. This latest design is said to further increase the potentialities of the machine with respect to high-speed hobbing and accuracy of the various cutting systems. Spindle speeds for hob revolutions are 117, 167, 235, 339 and 470.

Three models of gear testers will also be shown, including one large size of up to 30-in. center distance. For the first time, the company will exhibit a new and improved design of micro projector with a 14-in. diam screen and interchangeable magnifications from 10 to 100. Also shown will be a two-inch center distance gear tester for spur and helical gears. This machine is designed so it may be placed on the measuring table of the projector where the action of the gear may be observed on the screen. George Scherr Co., Inc., Booth 710.

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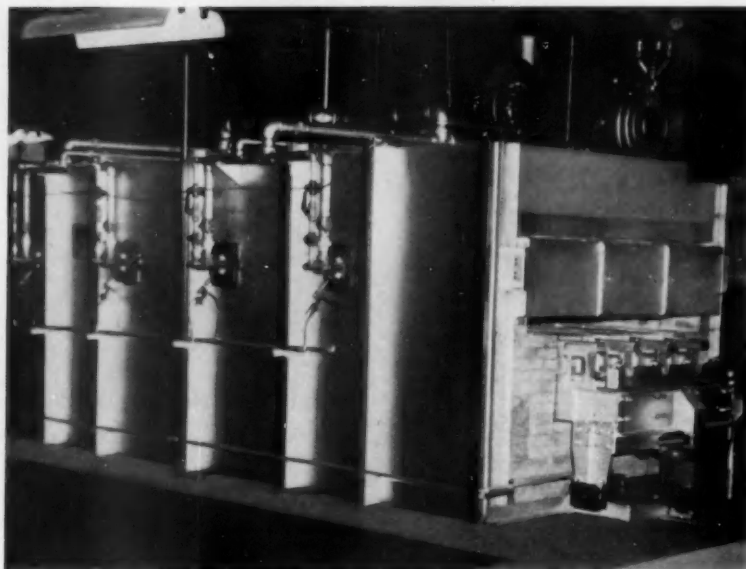
Small Diameter Tubing

On display will be sample tubing lengths of 63 standard analyses (tube hollows and strip regularly carried in stock for processing) and 32 special analyses (raw material customarily procured against customer orders). Both seamless and Weldrawn (fusion welded from strip and cold-drawn to re-crystallize the weld area) tubing will be shown.

The company points out that the extreme high temperature, corrosion-resistance and mechanical and physical requirements of latest products has created a demand for small tubing drawn on a production basis from materials once considered experimental. As a result, it has expanded its standard and special analyses, and has for the first time published the entire list, copies of which will be available at the show. The published list, Data Memorandum No. 1, groups the analyses into carbon, alloy and stainless steels, nickels and nickel alloys, titanium and zirconium base alloys, copper and copper base alloys, glass sealing alloys and nickel cathode materials. Superior Tube Co., Booth 1220.

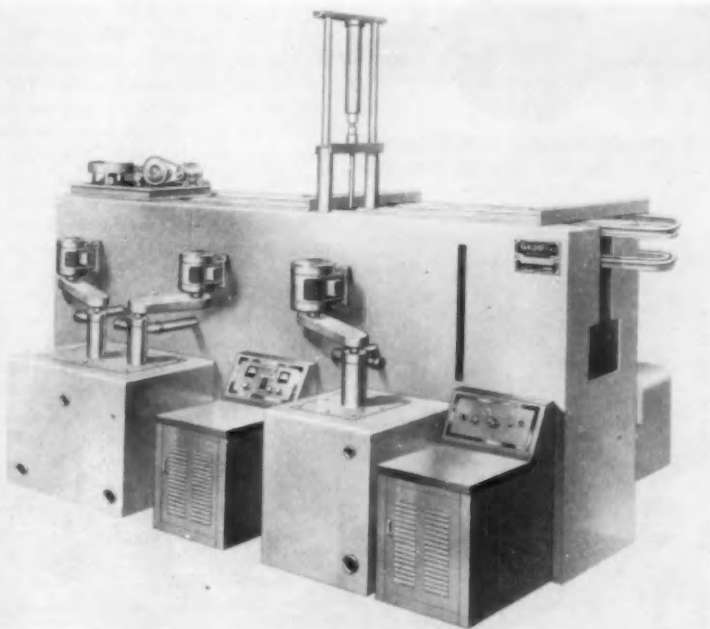
Circle 40 on postcard for more data

Walking Beam Furnace



A working model of the new walking beam furnace pictured will be on display. It features non-alloy construction and a basic design suited for high temperature forging operations as well as heat treating and annealing. The water cooled I-beams with special refractory piers are said to eliminate beam warpage, fatigue, operating jams and the need for alloy parts. Currently in use by an automobile spring manufacturer, it heats 4000 lb of leaf spring material to forming temperatures up to 1700 F. (Sunbeam Corp., Booth 942)

Circle 41 on postcard for more data



Ranshoff five-stage ultrasonic cleaning system

Automatic Ultrasonic Cleaning System

Visitors to the Exposition will see a completely automatic, five-stage, monorail, ultrasonic cleaning system in operation. To be demonstrated with actual production line parts, the machine will show how blind holes and difficult recesses of castings, engine parts, stampings, valve bodies and other parts may be thoroughly cleaned at high speed. The Bendix-manufactured ultrasonic unit is said to have been proven to be faster, cheaper and more effective than other methods of cleaning parts and assemblies. Grease, lapping compounds, cutting oils, and other contaminants are removed effectively.

The machine combines a single ultrasonic cleaning stage with more conventional wash, rinse and dry sections. Parts are carried through the machine on a new automatic indexing double monorail conveyor. In operation, the parts are loaded on fixtures traveling on the conveyor. They move through five stages consisting of wash, rinse, ultrasonic cleaning, rinse and hot air drying. In the washing, rinsing and drying sections, the parts are subjected to sprayed wash or rinse solutions or to drying air. In the ultrasonic cleaning section, the parts are lowered into the ultrasonic tank where high-frequency sound waves break contamination loose from the metal parts.

Solution tanks and drying air are heated with electricity and temperature-controlled. The machine is placed in operation by pressing a single button; parts then proceed through the machine automatically, emerging cleaned and dried. *Ranshoff, Inc., Booth 2734.*

Circle 42 on postcard for more data

Flash Welder

A new flash welder for steel products that trims the flash extrusion as it makes the weld will be introduced at the show. Called "Synchro-Shear," it is a further development of the "Synchro-Matic" flash welder, a precision controlled, automatic resistance welder. The shearing action is an integral part of the welding cycle and follows immediately after the upset motion. Since the time required for "synchro-shearing" the flash is measured in cycles, there is no appreciable difference in production rates compared with conventional flash welding. However, work-handling associated with flash trimming as a separate operation is eliminated.

The welder will handle carbon steel from mild to 1.00 carbon, high speed steel, high alloy steel and stainless steel. It will weld and trim all shapes normally encountered in flash welding, including flats, squares, rec-

tangles, rounds and most irregular or extruded shapes. It delivers the product ready for use; in most cases no further post-weld cleanup is necessary. When a highly finished product is desired, the weld area is said to require only the same treatment as the rest of the part. *Thomson Electric Welder Co., Booth 1751.*

Circle 43 on postcard for more data

Testing Machines

One of a line of new, low capacity testing machines, which are available as special tension, compression, flexure or universal testing machines, will be exhibited for the first time. Called Lo-Cap Electromatics, these machines perform their testing functions in capacities from 1000 lb down. According to the manufacturer, their compact design (each machine occupies five square feet of floor space) makes them ideal for "on-the-spot" quality control tests on production lines.

Load is indicated on a 15 in. diam Selectorange dial, mounted on top of the machine. Either of two capacity ranges—full and 1/5 or 1/4 capacity—are instantly available at the flip of the convenient range se-

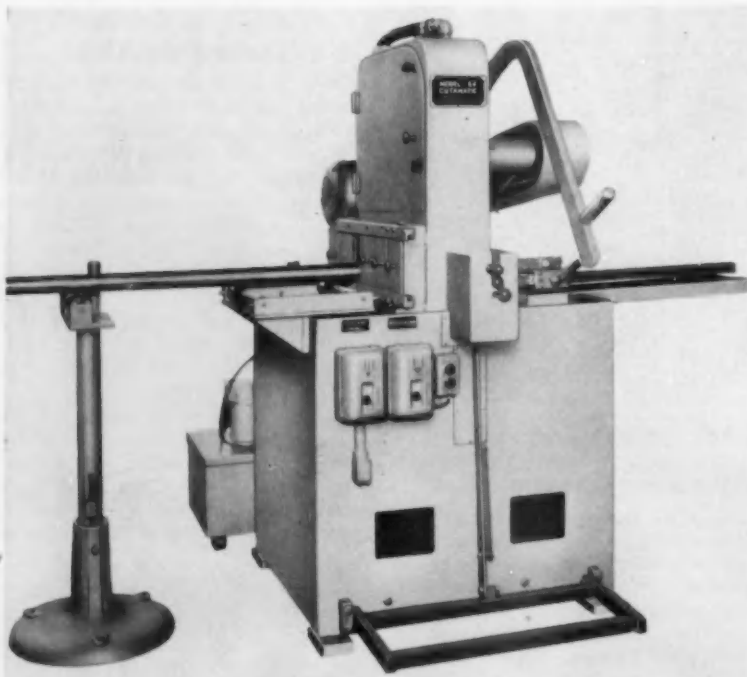


Lo-Cap Electromatic tester

lector switch. Both ranges have the same zero and are provided with individual zero adjusters. The single range of infinitely variable speed, normally from 0.3 to 12 ipm, but also available in other 40 to 1 ratios, is said to be positive under load as well as no load. *Tinius Olsen Testing Machine Co., Booth 1137.*

Circle 44 on postcard for more data

FOR ADDITIONAL INFORMATION
please use reply card on Page 97



Campbell Model 64 oscillating wet abrasive Cutamatic

Abrasive Cutting Machines and Wheels

In a joint display of machines and wheels, latest techniques in dry and wet abrasive cutting will be demonstrated. Included in the exhibit will be a new machine, the Model 64 oscillating wet abrasive Cutamatic, for cutting medium-sized bar stock, etc., through an oscillating cutting motion. Equipped with a large diameter abrasive wheel, up to 18-in. for certain applications, it will sever sheets, angles, channels, pipe, tubing and solids of various analyses. This is said to include hardened or annealed steel, brass, bronze, monel, aluminum, magnesium, tungsten, tantalum carbide, beryllium, titanium, ceramics, phenolic plastics and glass. The unit is capable of cutting three-inch diameter solids, four-inch diameter tubing, and six by one-inch steel plate at 90 deg to axis, at speeds of approximately four seconds per square inch of material being cut. Its swivel type vise can be rotated from 0 to 45

deg, with a maximum opening for 45-deg cuts of four inches.

Also displayed in the same booth will be a complete line of cutting wheels, such as aluminum oxide types for cutting steel, other metals and alloys, and silicon carbide types for cutting glass, ceramics, plastics and other non-metallic materials. *Campbell Machine Div. and Allison Div., American Chain & Cable Co., Inc., Booth 1618.*

Circle 45 on postcard for more data

Spectrometers

A new type direct-reading spectrometer, for use by the metals fabricating industries in analysis and quality control, will be displayed in miniature. Company engineers will use this scale model to describe the instrument's newest feature, a specially-developed fully-automatic servo monitor which keeps the unit's optical system aligned at all times,

eliminating the need for close control of laboratory temperatures.

Illustrative of its application is a present use of spectrometer for analysis of elements in molten metal from which castings such as blocks, cylinder heads, and flywheels are made. Some 165 samples are run through the laboratory during two eight-hour shifts to control the quality of 2000 tons of gray iron poured daily. Total time for simultaneous analysis of six elements is less than 40 seconds. Analysis is for the major elements of manganese, silicon and chromium, and the residual elements of molybdenum, copper and nickel.

Another recently-introduced instrument, called the Spectromet, will also be discussed at the show. It is a specialized version of the direct-reading spectrometer that enables automatic, simultaneous analysis of up to eight elements in a melt. *Baird Associates-Atomic Instrument Co., Booth 1234.*

Circle 46 on postcard for more data

Ductility Testers

A "push-button" demonstration of ductility testing of sheet metal will be one of the featured attractions in a booth. The visitor is invited to press a button which will automatically put the machine through one testing cycle.

Also being exhibited is a new ductility (cup) tester designed especially for testing thin metals, including copper, brass, aluminum, tin plate, stainless steel and carbon steel, in thicknesses from 0.003 to 0.062-in. *Steel City Testing Machines, Inc., Booth 1324.*

Circle 47 on postcard for more data



*Steel City Model D cup tester
(Turn to page 88, please)*



*Advanced Designs
Greater Economies*

FANS

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TURBOCHARGERS

DAMPERS

SEALS

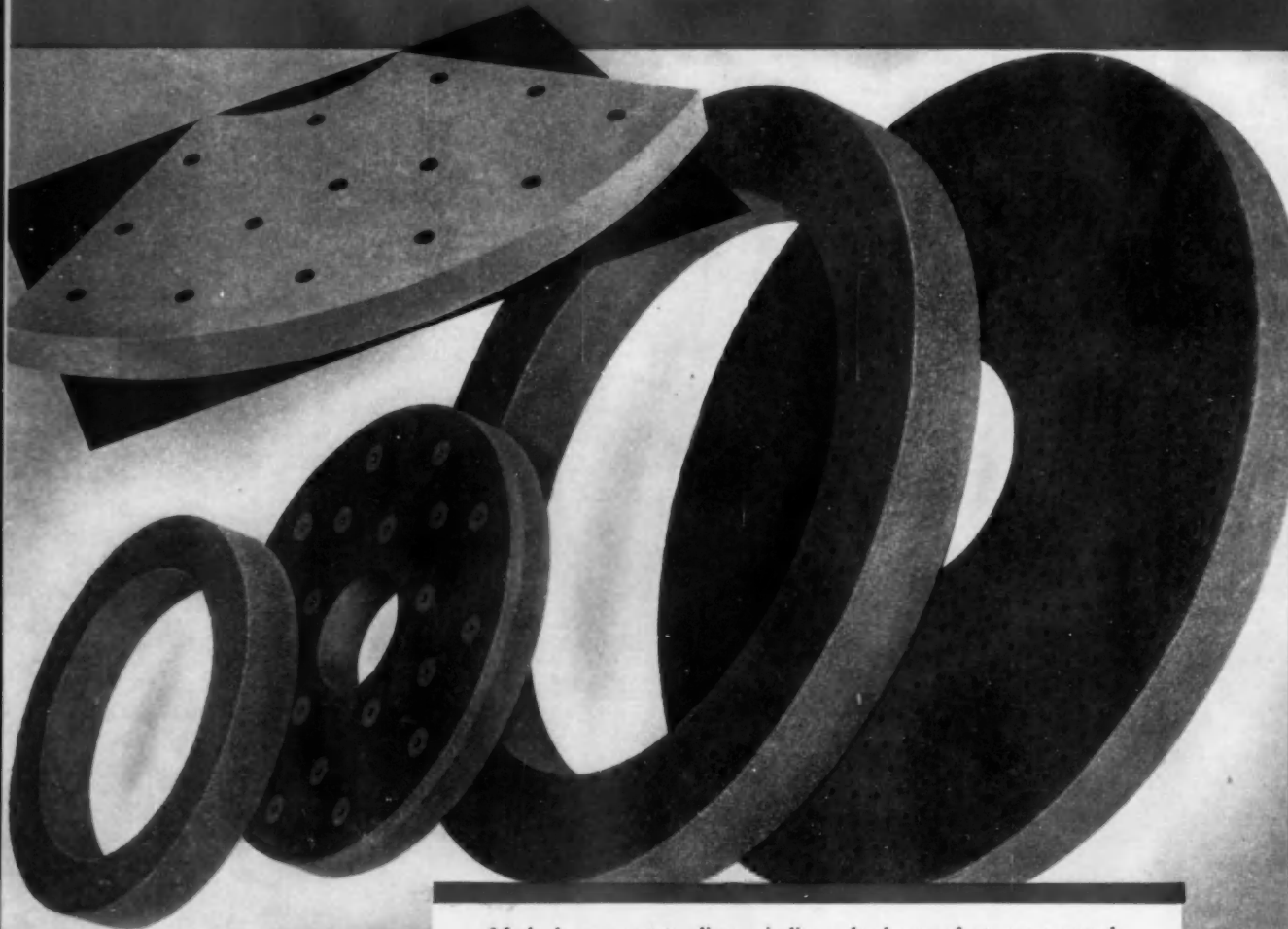


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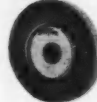


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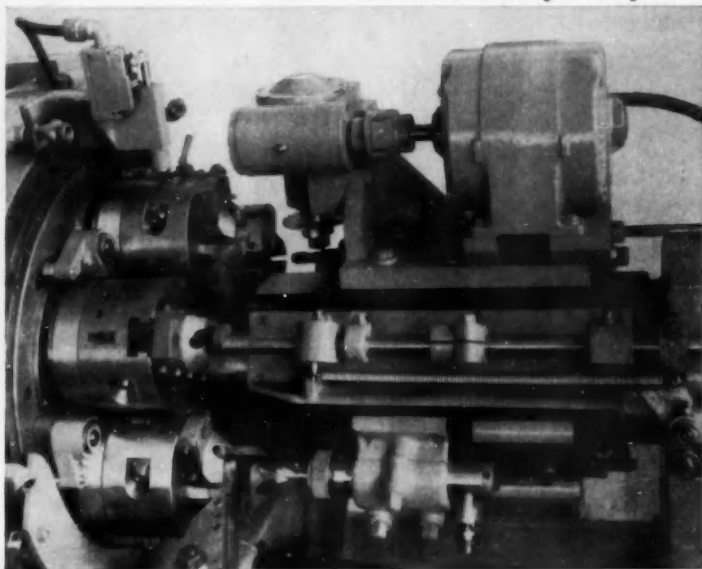


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It pays to combine hard-to-handle operations on a versatile **BAIRD 76H CHUCKER**



industry's most versatile
high production chuckers

A glance at this photograph will show you how straightforward and "clean" the arrangement is. Yet a wide variety of operations is being performed to close tolerances on a difficult workpiece.

A unique feature is the milling of the locating slot in the direct center of the part. The milling is accomplished by stopping and accurately locating the chuck. This locating slot is used on all subsequent operations on other machines. The forming of the shape on the lead of the hole, plus the grinding relief, is done by a combination slide with a form tool.

The outer face is machined from the cross slide, which incorporates a relieving motion to eliminate draw-back marks.

Sequence of Operations: Drill, bore and ream .735 - .739 center hole, face end, recess back of center hole for grinding relief, form radius on open end of hole (combination slide), and mill $.1875 \pm .001$ locating slot.

Production: Cycle time 44.5 seconds per piece, 80 pieces per hour gross.

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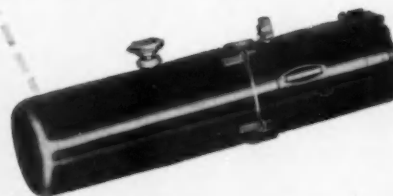
hydraulic power at the push of a button ...with self-contained Pesco package

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Pesco Hydraulic Power Packages include an electric motor, hydraulic gear pump with integral relief valve, check valve and reservoir in a single, self-contained assembly. The Pesco gear pump features "Pressure Loaded"* bearings for higher volumetric efficiency and longer service life.

Original equipment manufacturers are invited to obtain price quotations or specific information from your nearest Pesco sales engineer or write: Pesco, 24700 North Miles Road, Bedford, Ohio.



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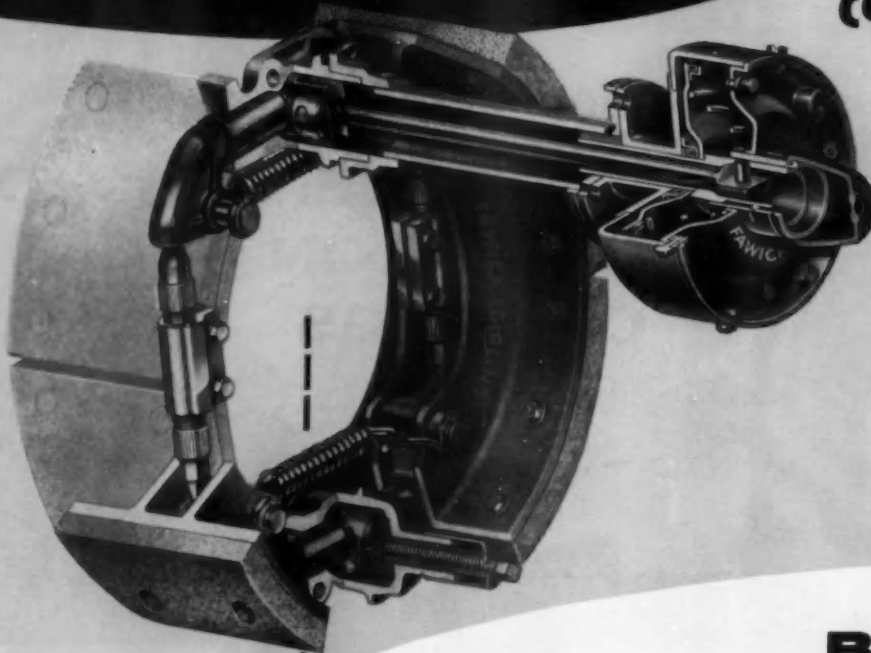
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Advanced "Two Leading Shoe" design provides:

greater torque capacity than same size cam brakes plus highest braking efficiency in both forward and reverse.

weight savings—2LS Brake with actuation is 20% lighter than same size cam brake.

fewer lining replacements through superior wear pattern.

direct actuation — air*, vacuum or hydraulic—no cam shafts or slack adjusters.

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News of the MACHINERY INDUSTRIES

By Thomas Mac New

Census Releases '54 Machine Tool Report

During 1954, manufacturers in the machine tool industry shipped products valued at \$1,147,000,000, an increase of 132 per cent over 1947, according to preliminary results obtained from the 1954 Census of Manufacturers conducted by the Bureau of the Census, Department of Commerce. Average employment in this industry has increased 16 per cent since 1947 (when the last Census of Manufacturers was taken) to a total of 81,000 employees in 1954. Value added by manufacture in the industry amounted to \$788 million in 1954, an increase of 130 per cent over 1947.

The value of shipments, as reported by establishments classified in the machine tool industry, consisted not only of products described above as primary to the industry, but also included the value of secondary products. The \$1,147,000,000 total value of shipments reported consisted of \$1,104,000,000 manufactured products and \$43 million miscellaneous receipts for contract work, repair work, sales of scrap, etc. The \$1,104,000,000 product shipments were accounted for by \$927 million of machine tools and other products primary to the industry, and \$177 million of products primary to other industries (e.g. metal-working machinery, other than machine tools, jigs and fixtures, small cutting tools, precision measuring tools, other metalworking accessories, woodworking machinery and other special industry machinery). Thus, the industry's shipments of machine tools represented 84 per cent of its total manufactured product shipments.

In 1947 the industry's shipments of machine tools represented 77 per cent of all products manufactured. The industry, therefore, has been concentrating more on its primary product rather than in secondary products relating to the line.

Tax Depreciation Effect

Machinery & Allied Products Institute has just put out a very interesting booklet on what effect the new tax depreciation methods have on the earnings of depreciable assets. Four points made by this booklet are worthwhile bearing in mind. These are:

1. Whatever the level of after-tax return with straight line-tax depreciation, the substitution of either of the new methods (double-rate-declining-balance or sum-of-digits) effects a substantial improvement.

2. The increase in equity return rates from the use of either of the new methods is greater when part of the capital is borrowed than when it is entirely equity.

3. The double - declining - balance method with straight-line switch is more favorable than sum-of-digits

for very short service lives, but is somewhat less favorable for others.

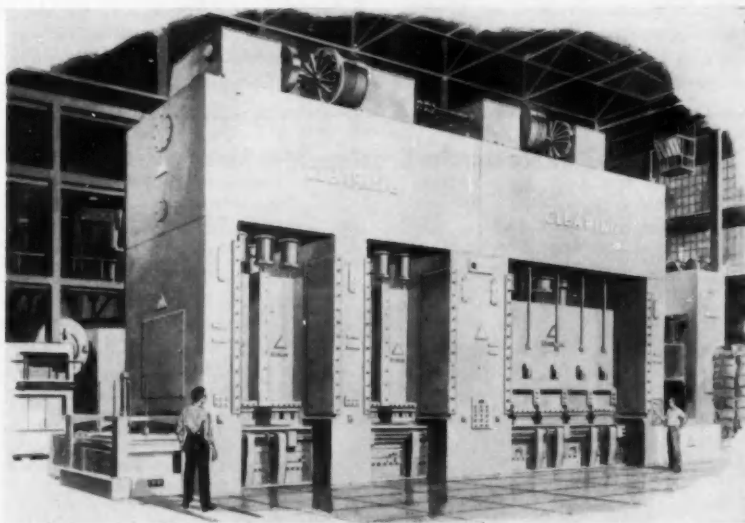
4. The gains in the after-tax rate of return on the investment in medium-lived assets are 10 to 15 per cent higher when the new methods are used for tax purposes than when the traditional straight-line writeoff is used.

The study advocates adoption of the new methods of tax depreciation since improvement can be obtained with little effort and expense.

Tool and Die Activity High

The National Tool and Die Manufacturers Association has reported that orders for special tooling are being received at a very satisfactory rate in most production centers. Manufacturers most active in the pur-

(Turn to page 132, please)



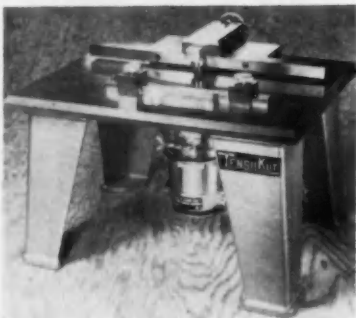
Clearing Machine is using this new concept in press design as a means to alter the physical characteristics of the presses to provide for future changes in manufacturing requirements. The modular-type equipment may be used as separate presses or added in order to make a three or four press integral line. Presses may be changed in any manner so as to alter the sequence of tonnage capacities and increase or decrease the number of available stations in an integrated line. This modular Transflex equipment is Clearing's idea of long range obsolescence insurance.

(Continued from page 80)

FOR ADDITIONAL INFORMATION
please use reply card on Page 97

Test Specimen Machine

First public showing will be made of the Tensilkut II, a machine with increased power and capacity for machining tensile test specimens from sheet and plate materials. Specimens 0.0005 to 0.500-in. in thickness can



Tensilkut II machine for preparing tensile test specimens

reportedly be accurately machined to ASTM specifications from ferrous and non-ferrous metals and plastics in less than three minutes. It is also said that excellent results are obtainable on light gage titanium and super alloys to 0.062-in.

The new model with its increased

controlled power is stated to produce fine undistorted edges with no measurable amount of cold working and with no evolution of heat. A precision master template enables control of specimen tolerances to a consistent accuracy of as close as ± 0.0005 -in. The machine is light in weight and portable. *Sieburg Industries, Inc., Booth 2770.*

Circle 48 on postcard for more data

Grinding Machines

Featured in an exhibit will be a new traverse reversing device on a centerless grinding machine. The company will demonstrate for the first time its Type 614 centerless grinder using abrasive belts as cutting and feeding media. This machine will handle long bars and tubes up to four-inch diam using power-driven fixtures. For heavy stock removal requiring several passes, the traverse reversing device is used which permits grinding of the workpiece in both directions of traverse.

Another new machine to be shown for the first time is a twin belt surfacing machine with rotary feeding fixture. This machine will grind both

ends of slug stock simultaneously at high production rates.

Two centerless machines connected in tandem will also be demonstrated showing a precision grinding operation and a two-pass finishing operation on cylindrical bar stock. These machines operating as a unit will reportedly produce accurate work and a low micro inch surface finish in a single handling. *Production Machine Co., Booth 1809.*

Circle 50 on postcard for more data

Hardness Tester

The center of attraction at one booth will be a new motorized hardness tester, Model Y, a semi-automatic, high-capacity unit. It features a short test cycle to permit an increased number of Rockwell readings to be taken and recorded within a definite time period.

This instrument has an illuminated dial gage, identer light and the Set-O-Matic dial gage. With this latter gage, it is no longer necessary to set the large hardness indicator pointer to zero manually because the pointer will automatically return to zero when a minor load is applied. Being motor-



Wilson Model Y Rockwell tester

ized, the motor's function in the test cycle is to remove the major load. The cycle of major load operation may be adjusted to less than two seconds and application is controlled through a dashpot, which gives variable speed control if desired. Power is supplied to the unit from a 110-v, 60-cycle, single phase a-c line. *Wilson Mechanical Instrument Div., American Chain & Cable Co., Inc., Booth 1211.*

Circle 51 on postcard for more data

Electronic Erosion Machine



To be unveiled at the show will be an entirely new electronic erosion machine which will be in operation, with all covers off, machining carbide, stainless honeycomb and titanium. It is said to reproduce directly the shape of a soft master electrode in carbide or hard alloy, through the use of a spark, with an accuracy of ± 0.0015 -in. and 10 microinch finish. Illustrated is the machine's application to a Frey miller. *(ABACO Industries, Inc., Booth 2434)*

Circle 49 on postcard for more data

NEW**PRODUCTION
and PLANT****EQUIPMENT**

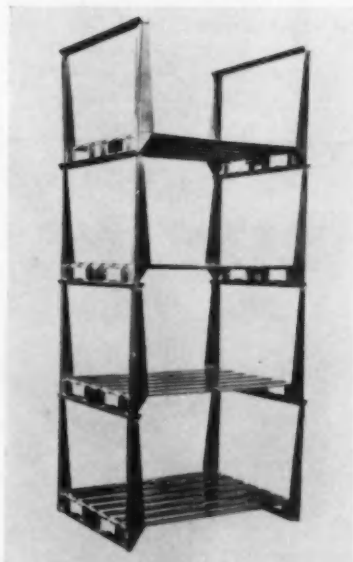
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Portable Stacking Rack

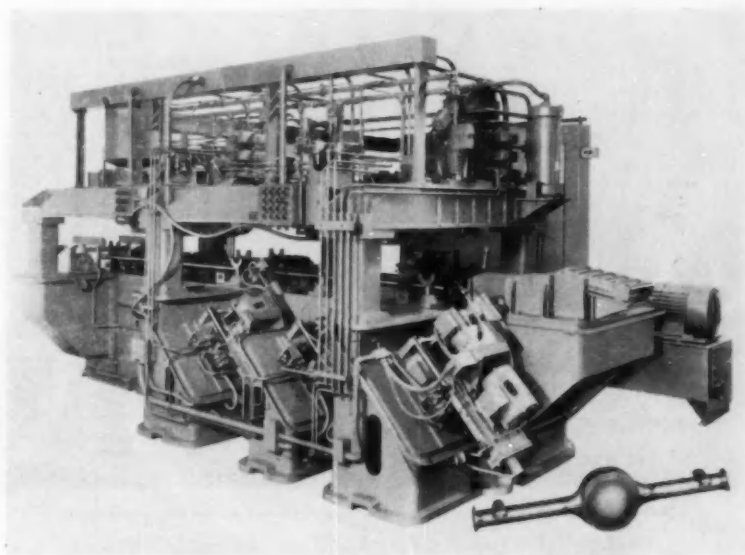
A PORTABLE stacking rack, designed for handling and storage of package materials, products or parts which cannot be stacked without support, has recently been developed. The open-side steel frame units bring portability to the field of shelving because they can be moved by fork lift or platform truck, according to the needs of production and inventory. If required, they can be used as "handling" racks and moved to a work or processing area to receive finished parts. At the same time, they can be stacked to any practical height when loaded or unloaded, and can be used to form either permanent or temporary warehousing facilities in any available area.

The open sides of the units facilitate order picking, tally and inventory work. Varying in size, the units are made to specification according to the size and shape of the material to be handled. Such material can be in the form of a package, carton, or balanced-weight part or end product. *Pressed Steel Div., Republic Steel Corp.*

Circle 60 on postcard for more data



Portable open-side stacking rack



LaSalle Line-O-Matic performs a series of operations on rear axle housings

Machine Automatically Processes Rear Axle Housings

CALLED the Line-O-Matic, a new machine automatically pierces, extrudes, drills, taps and assembles plugs in rear axle housings for passenger cars and trucks. The machine handles a welded assembly on which there has been no previous machining. Any one of three different housings can be processed with no additional locators being required. Loading and unloading are also automatic.

When the part is loaded into the machine from the conveyor line, it trips a limit switch, which in turn initiates the cycle of the machine. The part is shuttled to the next station and lifted into the fixture, after which the shuttle returns. The part is located up and down from four points on the banjo face. The endwise location is taken from four points inside the banjo. Angular location, as well as up and down clamping, is taken just outside the banjo on the tube. All locating surfaces are said to be dirt and chip-free because they are upside-down.

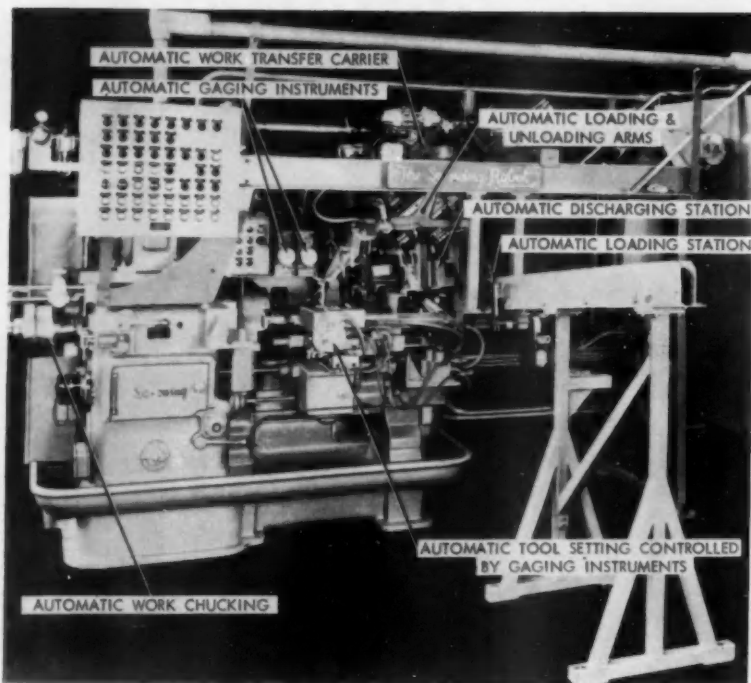
At the first work station, drawing

compound is automatically applied and then the drain hole is hydraulically pierced and extruded. At the next station the drain hole is tapped for a $\frac{3}{8}$ -in. pipe plug; and the vent hole is drilled to a $\frac{1}{4}$ -in. pipe plug. At the next station Permatex is applied to the drain hole, using a built-in system on the machine for metering the amount required. Also at this station, both sides of the vent hole are deburred. At the following station the machine automatically feeds and runs the $\frac{3}{8}$ -in. pipe plug into the drain hole to 30 lb-ft torque. The supply of pipe plugs is hopper-fed. In addition, the vent hole is tapped for a $\frac{1}{4}$ -in. pipe plug. At the last station the housing is turned over and unloaded on to the conveyor line.

The machine is built to JIC hydraulic and electrical standards. It has automatic lubrication, and a central coolant and chip system. The chips feed on to a conveyor, into the central plant system. *LaSalle Tool, Inc.*

Circle 61 on postcard for more data

Lathe Automated With Automatic Work Handling and Sizing Equipment



Seneca Model LR Lo-swing lathe fully equipped for automatic production

FOR machining the outside diameter of small electric motor stators, a lathe has been completely equipped for automatic operation. The automatic features are input conveying, loading of parts, machining operation, unloading of parts, gaging with feed-back for tool adjustment and tool indexing, and output conveying.

In operation, the stators are fed by gravity down the input conveyor into a pivoting cradle which elevates a rough stator into the loader arm fin-

gers of the work transfer carrier which immediately moves to the loading station just over the tooling area of the lathe. On completion of the machining operation of a previously loaded part, the spindle stops and the finished part is removed by the unloader arm fingers, which are located on the rear side of the V-shaped transfer carrier casting. The loader arm fingers then lower the rough stator and position it on an expanding arbor where it is securely clamped by

an air cylinder mounted on the end of the spindle. The loader arm then retracts and the headstock spindle clutch is energized, starting the machining operation.

The finished turned stator, which is in the unloader arm fingers, is then transferred to the output conveyor and is fed by gravity to the gaging station at the rear of the lathe. Gaging is by the Lectrolair system and the stator is checked for size on both ends simultaneously. If the part registers on the mean tolerance, no signal takes place. However, if the diameter tends to increase, but is still within the tolerance, a signal is stored in a memory device to count the pieces of such size. After a pre-determined number of consecutive high tendency gaging parts, a signal is sent to the control panel and the turning tool is automatically advanced 0.0005 in. which will bring the turned diameter just over the low limit tolerance.

The above procedure is repeated a pre-determined number of times, after which the turret tool post is automatically indexed to present in working position another of the four tools held in the four-tool turret. After the four tools have been used, the machine will stop and a light will signal that a tool turret change is required.

After gaging, the stator is ejected from the gaging station and rolls by gravity to the motor assembly department. The installation is completely automatic and the parts are not touched from the time they arrive via the input conveyor until they leave the output conveyor after the gaging operation. *Seneca Falls Machine Co.*

Circle 62 on postcard for more data

Proximity Limit Switch

KNOWN as a "proximity" limit switch, a new device converts mechanical position or motion into an electrical signal without physical contact between the part and the switch. The part must be of ferrous material. Available with either relay output or tube output, the switch may be used in existing 110-v control circuits. The relay type panel has an output capacity of five amperes and the fully electronic type has sufficient capacity to energize a small control relay.

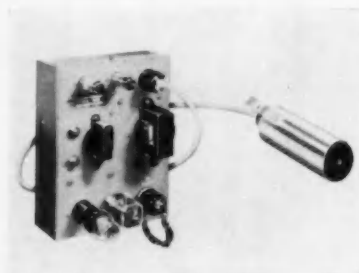
Since no mechanical contact with the switch is required, it has application in places where it is impos-

sible or impractical to apply conventional limit switches. Small parts, fast moving parts, and parts with rough edges are said to fall into this classification. The transducer (sensing head) is magnetic in nature. Since it is not affected by vibration or the presence of non-magnetic foreign material on its surface, it lends itself to application possibilities in paint spray systems, stamping presses, and heavy automation equipment.

It is stated that sensitivity of the switch is such that large parts can be sensed at distances up to 1½ in. from the transducer head and that even very small parts will actuate the

device at a one inch distance. *Square D Co.*

Circle 63 on postcard for more data



Square D proximity limit switch

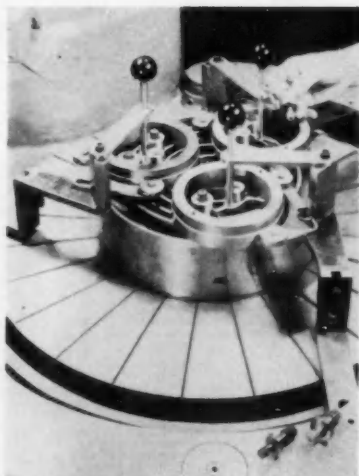
Tooling for Flat-Lapping

FLAT-LAPPING of shoulder faces, as well as other lapping, can now be done with a new Lapmaster tooling arrangement that consists of a 12-in. grooved lap plate mounted in the center of a 24-in. lap plate. This permits the lapping of shoulder faces, such as the aviation fuel pump parts illustrated. The 12-in. lap plate can then be removed to permit lapping of other work pieces on the standard Model 24 Lapmaster. This tooling is said to effect a considerable saving because it eliminates the cost of purchasing a complete machine for this type of lapping.

The tooling arrangement is stated to be equally adapted to other parts where precision finish and flatness are required. These include valve bodies and discs such as those used on diesel locomotives. Valve bodies of this type have a protruding stud. Thus, the 12-in. lap plate can be used for the valve body with the stud, while the 24-in. lap plate with conditioning rings is used for compressor discs and other flat parts. This tooling arrangement can also be supplied to fit the new 36-in. model Lapmaster.

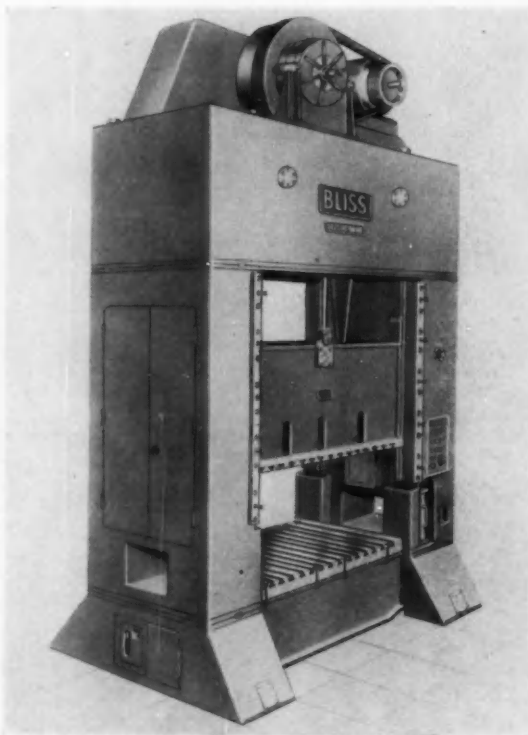
Lapmaster lapping machines are used to generate surface flatness to less than one light band and finishes to two RMS in short or large production runs. Typical applications are parts for engines, transmissions, tool and die equipment and quartz and germanium crystals. *Crane Packing Co.*

Circle 64 on postcard for more data



Lapmaster tooling permits flat-lapping of shoulder faces and other flat-lapping on standard Model 24 machine

Bliss SE-2 line of single-action eccentric-gear two-point presses is based on a "unitized" principle of construction which is said to be new to the industry. Featured are simplified maintenance and a flexibility of design which permits the user to select equipment to fill individual requirements.



Unitized-Design Eccentric-Gear Presses

DEVELOPMENT of a line of single-action eccentric-gear two-point presses based on a "unitized" principle of construction, was recently announced. This is said to simplify maintenance and to allow the press buyer to "build" a press to his needs.

The principle involves a quill-mounted flywheel and overhung clutch built into a unitized gear case on which the main motor drive is mounted. Except for the main gears, nothing is built into the crown. As a result, the entire drive can be removed from the press as a unit and reinstalled with a minimum of time and effort. Other maintenance advantages are said to accrue from this new design. Belts can be replaced without removing anything but the brake pins. The entire clutch can be taken off by removing the brake bracket. The quill assembly, clutch and all, can be taken out of the gear case by removing six screws.

Another feature is that all presses in the line are available as a "basic" press, with no inbuilding or extras unless specified. The flexibility of the basic design also enables press users to have features added to or subtracted from the press to meet individual needs.

Among the special features that can be added, in whole or part, are: provision for automation controls and feeds, inbuilding, various types of automatic lubrication, air and electrical outlets for maintenance tools, die lights, air control manifolds, and special controls.

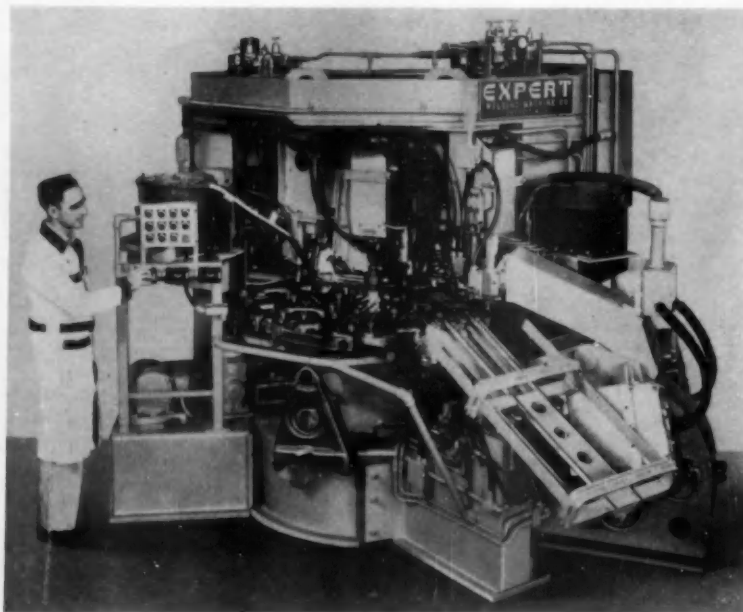
The new presses are available in a full line of tonnages in both double- and single-gear models. *E. W. Bliss Co.*

Circle 65 on postcard for more data

Spray Booth Compound

INTRODUCTION has been made of a non-caustic, non-oily, non-foaming compound for conditioning the water, protecting equipment and reclaiming paint in water-type spray booths. It is especially formulated for use with lacquers. Designated No. 1160, the compound does not digest the paint or break it up into small particles. It is said to operate on a new principle, forming a protective film around the paint molecules and causing them to float rather than sink. The "captured" paint can reportedly be skimmed off in condition for reclaiming. *Klem Chemicals, Inc.*

Circle 66 on postcard for more data



Expert seven-station rotary index projection welding machine welds two tee nuts, three weld nuts and a steering stop bracket to suspension arm assemblies at a rate of 400 per hour

Automated Welder Positions and Welds Parts

NOW available is an automated seven-station rotary index projection welding machine designed for accurately positioning and welding nuts or brackets to surfaces of production parts. The machine features a stop and start cam drive mechanism that controls index and weld sequences, bowl feeders equipped with hopper feed tracks, a transfer device for delivering weld nuts to the projection welding guns and a unique mechanism for projection welding brackets to production parts. An air-powered unloader mechanism automatically removes the finish-welded assemblies from the machine.

The model illustrated projection welds two tee nuts, three weld nuts and a steering stop bracket to automotive suspension arm assemblies at a rate of 400 per hour. Parts to be welded are manually loaded into the fixture at station one which is the position at the front of the machine. The parts are then automatically indexed to idle station two. In the third station a vibratory hopper feeds the tee nuts to two hopper feed tracks from which two horizontal air-operated mechanisms automatically transfer the tee nuts to spring clips located on the electrodes of the welding guns. Two overhead air-operated welding guns then move downward, posi-

tioning the tee nuts and welding them in place. An overhead air-powered hold-down cylinder holds the part in place during this operation.

In the fourth station, a steering stop bracket is manually loaded into the fixture. Three weld nuts, fed through two vibratory hoppers and three feed tracks, are projection-welded to the part in the fifth station in the same manner as the tee nuts in station three.

At the sixth station, the steering stop bracket is projection welded to the outside edge of the suspension arm. An overhead hold down and locator cylinder locates this bracket on the part. Two pinch guns, each one operated by a lever arrangement and an air cylinder, move upwards from below the index table and weld the bracket to the outside surface of the suspension arm assembly.

The part is automatically unloaded at the seventh station by two air-operated unloader arms that move radially inward through the fixture. The unloader mechanism then pivots, moving the arms upward and strips the finish-welded assembly from the fixture. The assembly then slides outward and downward from the machine to a conveyor. *Expert Welding Machine Co.*

Circle 67 on postcard for more data

Rotary Actuator

SAID to be a new concept in rotary fluid power, a rotary actuator features full 360 deg rotation and positive stopping at any position. It is a self-contained power unit designed to operate on air, gas, water or oil pressure. A fast and positive rotary motion is delivered by means of a piston and simple internal helix, as shown in the illustration.

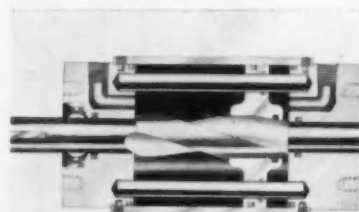
An almost unlimited number of motion applications are said to be possible with the new actuator. Some of the present applications include: Indexing, positioning, transfer mechanism, valve actuating, ratchets, gate opening, dumping, cam actions, mixing, power takeoffs, tumbling, automatic conveyor stops, breech locking, rolling clamping, and lifting.

The design of the actuator reportedly allows it to deliver its rotary motion powerfully, but at the same time, safely. The actuator can be stopped at any point in the rotation cycle, and held there indefinitely. There is no by-pass leakage or pressure loss, and because of the unique internal helix, the work load is firmly held in position and cannot back off under reverse tension, shock, or vibration, even if a complete power loss occurs, it is claimed.

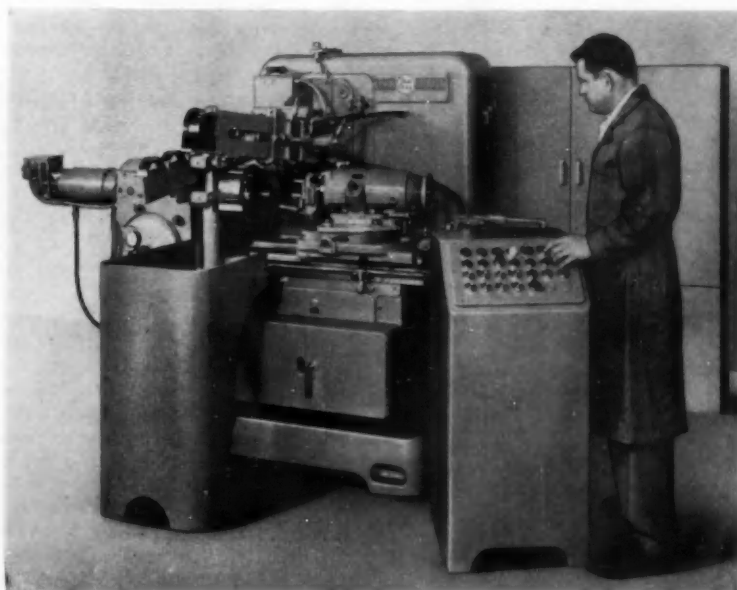
This new product is totally enclosed, which can be important where exposure and other unusual operating conditions exist. Through the use of anti-friction thrust bearings it is possible to operate the actuator on pressures from 5 to 500 psi. It is available with built-in valving or with attached pump, motor and reservoir, or all of the foregoing, if desired.

The company is building the actuator in a variety of standard sizes including three, four, five, six and eight-inch diameters. Standard rotation cycles are 0 to 100-deg; 0 to 190-deg; 0 to 280-deg; and 0 to 370-deg. Where required, larger sizes and greater rotation cycles can be furnished. *Carter Controls, Inc.*

Circle 68 on postcard for more data



Carter rotary actuator



Red Ring fully automatic loader for internal gears, installed on a Model GCR internal gear tool shaving machine. The loader handles a 75-tooth, 20-pitch, 4-in. pitch diam, 20-deg pressure angle, 18½-deg helix angle internal gear at the rate of 70 gears per hour.

Automatic Loader Handles Internal Gears

DESIGNED for handling spur or helical internal gears on shaving machines, a new fully automatic loading device is said to solve the problem of meshing the teeth in an internal gear with those of the helical gear-shaped shaving cutter. An intermediate air-powered loading sleeve mechanism which receives the internal gears one-at-a-time from a magazine feed, hangs them on the cutter and provides the meshing problem solution. The loader can be installed on the company's Model GCR internal shaving machine.

Internal gears to be shaved are loaded in a magazine where they roll by gravity to a position in front of an air-powered plunger. The plunger pushes one gear at a time into the loading sleeve, which is mounted on a swinging arm and swung through an arc by an air cylinder-controlled linkage. The pushing of an unshaved gear into the sleeve at this raised position causes a finish-shaved gear in the other end to be deposited in an unloading magazine where the shaved gears roll to a location at the front of the machine.

In the next loader sequence, the sleeve holding the unshaved gear is swung downward by the air cylinder into line with the work spindle center-

line. A finish-shaved gear in the chuck on the work head is ejected by another air cylinder into the sleeve. Entry of the finish shaved gear ejects the unshaved gear in the other end of the sleeve into mesh with the shaving cutter, where it remains hanging on the cutter.

Then the loading sleeve is raised back to the load position. The internal gear and shaving cutter are advanced as a unit toward the chuck in the workhead and the gear is chucked, ready for the shaving operation with the cutter in mesh with the gear. At the end of the shaving operation, the cutter spindle is backed out of the gear and returned to its original position for the loading of another unshaved gear. *National Broach & Machine Co.*

Circle 69 on postcard for more data

Solvent Detergent

COMBINING thorough cleaning ability with safety factors, a new solvent detergent is designed to remove grease, oil and dirt from machinery and electrical equipment where water cannot be used. Called Composition No. 117, the material has a flash point of 185 deg, Cleveland open cup. It has an exposure tolerance rating

two and a half times greater than trichlorethylene and 20 times that of carbon tetrachloride.

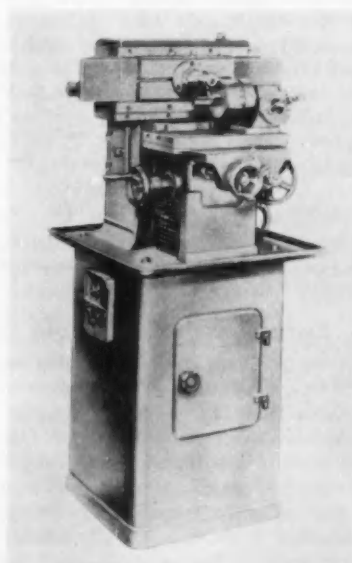
It is used full strength, applied by brush, or immersion, or a non-atomizing spray. No rinse is necessary; parts may be blown dry with compressed air. For certain uses it is possible to use the material diluted with up to equal parts of high flash petroleum distillate. *Oakite Products, Inc.*

Circle 70 on postcard for more data

Form and Punch Shaper

FOR making irregularly-shaped stamping and electrode punches of high precision, a new form and punch shaper has been introduced. Called the Model K-150, it is said to produce close-tolerance punches with curved necks in one chucking and without the need of further machining operations.

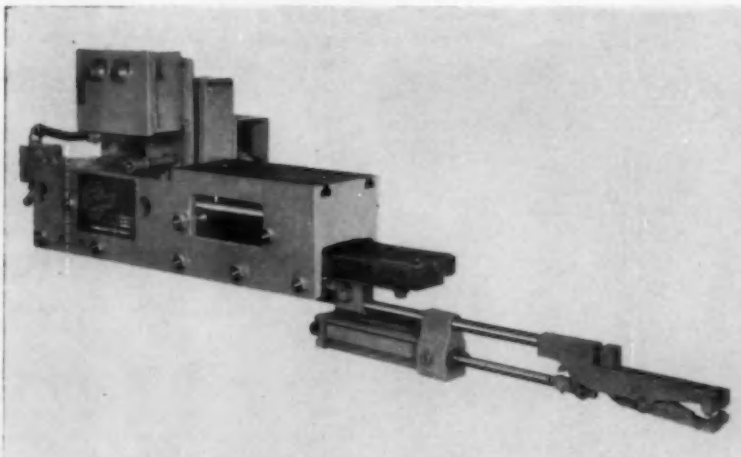
Workpieces are clamped directly in a collet holder, between centers or to the co-ordinate chuck. Co-ordinate chuck and indexing attachment guides the workpiece along the contour with one chucking, thereby avoiding re-chucking errors. Machining operations can be checked in the shaping process with the special built-in 30-



Jemco K-150 form and punch shaper

power microscope. This special microscope also serves as an accurate measuring device. *Jersey Manufacturing Co.*

Circle 71 on postcard for more data



The SESCO press unloader unit shown has a main cylinder stroke of 12-in. Through a double rack and pinion, this stroke is doubled, resulting in a 24-in. traverse. The iron jaw cylinder has a stroke of 8-in., and clamps the part by a mechanical cam, actuated at the extended position of the piston rod.

New Series of Automatic Press Unloaders

ONE line of pressroom equipment was recently expanded to include an entirely new series of automatic press unloaders. Each unloader is a fully self-contained unit, except for the limit switch. No floor structure is required; the assembly is contained in a casting and mounted on the press.

The unloader is synchronized with the press through a limit switch, and is operated by two air cylinders—a main cylinder, or lift cylinder, and a jaw cylinder for opening and closing the jaws. When the press signals that it is clear for unloading, the jaw cylinder moves the open jaw forward. At the end of the forward stroke, the jaw grips the part. At this point the main cylinder retracts, lifts the

stamping out of the die, and swings it clear of the press. The jaw cylinder then retracts, unclamps the part on a table or conveyor, and trips the limit switch. The main cylinder then returns to its normal waiting position.

The unloaders are available in five standard sizes to meet most unloading conditions. Jaw widths are adjustable for different width parts; and jaws are adjustable for different loading heights and for the angle of travel into the die. Parts can be swung out varying distances depending upon the method of mounting and the length of the arm. Special units can be built to serve unusual situations. SESCO, Inc.

Circle 72 on postcard for more data

Rotary Indexing Table

A 26-IN. heavy-duty air-operated rotary indexing table, designed to handle loads up to 500-lb, has been announced. Its unusual design is said to avoid over-indexing. An adjustable hydraulic control affords cushioned stops under load conditions. An innovation is the splash oiling system. All hardened moving parts are fitted to close tolerances for accurate indexing of ± 0.0005 -in.

Two micro switches are mounted on the outside of the table for accessible adjustment. Setup work is simplified by a double solenoid valve equipped with pushbuttons for

changeover from automatic to manual operation. Operating pressures range from 75 to 100 lb. It is available in from 6 to 18 stations. Pitt Industries.

Circle 73 on postcard for more data

Surface Inspection

STATED to be an improved method for detecting surface flaws by visual inspection, a new two-step process locates cracks, fractures, cold shuts, tiny surface fissures, porosity and imperfect welds on iron, steel, brass, aluminum, porcelain, plastics and ceramics, according to a recent announcement. By spraying a thin

coat of Dyeline dye and following with Dyeline detector, the location, type and extent of defects appear against an opaque background. In two minutes dwelling time, the dye and detector will reveal cracks as small as 0.0002-in. in width. Smaller cracks can be detected by increasing the dwelling time. A water wash removes the Dyeline immediately. Zip Abrasive Co.

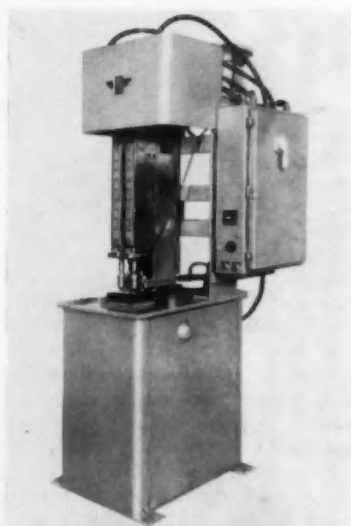
Circle 74 on postcard for more data

Automatic Stud Driver

TO meet the demand for a smaller version of 6-head and 12-head models, the new Model SD10-2 automatic stud driver, adaptable to from one to three heads, has been introduced. Heads can be changed to a new pattern quickly, using new spacer bars from factory drawings. Since the heads can be spaced as closely as 2½-in. center to center, they are said to be easily integrated into automated index tables or conveyor lines, such as the company's pallet transfer machine.

Heads are individually driven by ½ hp motors, a-c d-c or air torque, and are fitted with air-draulic or hydraulic connections. Units are equipped with JIC unit type electrical cabinet, vibratory four-track stud hopper, and either air-draulic or self-contained electric-hydraulic unit. Self-opening chucks, which are positive in drive, grip and release the studs without screwing out the driven studs. Syracuse Special Machine Co., Inc.

Circle 75 on postcard for more data



Syracuse Model SD10-2 stud driver

Rust Preventive

MISCIBLE with water, a new multi-purpose rust preventive base can be mixed with water, solvent or oil, or used without dilution. Identified as Rust Veto M.P., this water-displacing rust preventive base has a wide range of uses for indoor protection. When mixed with water, it provides a safe, non-flammable emulsion with high stability and protection value. It can be used to replace dangerous solvents or similar flammable slushes and is economical when mixed with water. *E. F. Houghton & Co.*

Circle 76 on postcard for more data

Electric Nut Runner

AN electrically-operated hand power tool for running nuts, with full power and speed to a positive preset torque, and then automatically shutting itself off when the preset torque is reached, has been announced. The "torsion bar" torque control Size 5UT Impactool is the first electric Impactool to utilize the "torsion bar" principle for automatic torque control.

Setting the tool to desired torque can be done easily and quickly by using a wrench to stress the "torsion bar" while it is held in a vise. After the bar is set to the desired reading, it is held in that setting by engaging



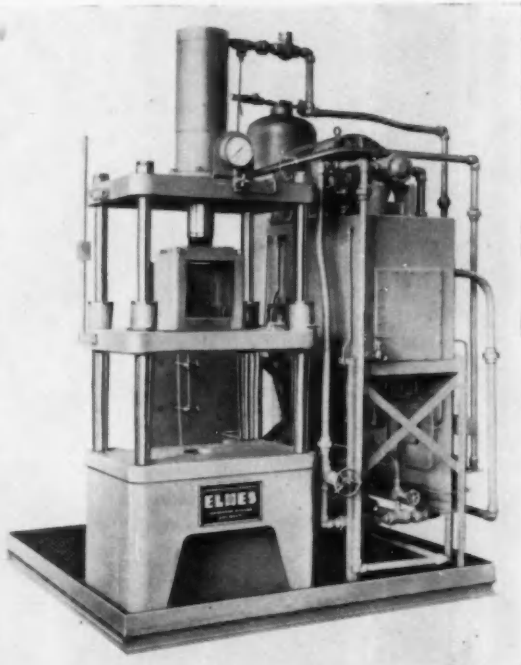
Ingersoll-Rand 5UT Impactool

splines on the torque locking sleeve with similar splines on the torsion bar driver. The torque locking sleeve is clearly calibrated, and setting the bar for the proper torque requires only a few seconds. Two "torsion bars" are available giving a torque range from 20 to 90 lb-ft.

In addition to simple setting, and precision control of torque combined with full power and speed of operation, the new 5UT Impactool is said to have the following advantages: (1) The torque setting remains constant until the adjustment is changed; (2)

The hydraulic die-casting press illustrated is an accumulator - operated unit designed for casting motor rotors by submersion into a pool of molten aluminum. The entire machine is a "package" unit consisting of press, accumulator, pump, valve subplate, and control panel, all mounted on a common base plate. The hydraulic circuit is designed for pushbutton operation with use of a fire-resistant fluid. Using customer's tooling, the operator ladles in the molten aluminum and closes the safety door which initiates the press cycle. Both loading and unloading are automatic. (*Elmes Engineering Div., American Steel Foundries*)

Circle 77 on postcard for more data



The tool is reversible, with full power being delivered in both directions; (3) The torque control is consistently accurate; (4) No stripping of threads or twisting off studs since the tool eliminates "over-torque" through the automatic shut-off; and (5) Maintenance is low, since there is no clutch to wear, slip, or require adjustments, and the tool is not subjected to unnecessary impacting.

By slipping off the "torsion bar" and turning the selector knob which controls the automatic shut-off device in the tool, it can be converted to a standard electric Impactool for multi-purpose use. With standard accessories it can then be used to drill metal or wood, ream, tap, drive screws, or do wire brush work.

The tool has a 1/2 in. square drive and takes bolt sizes up to 5/8 in. diam, weighs 6 1/2 lb, and has an overall length of 10 1/4 in. less "torsion bar," with side to center dimension of 1-15/32 in. It has an approximate free speed (forward or reverse) of 1900 rpm and delivers 1900 impacts per minute. The tool is available bare or with selected accessories in a series of kits. Models are available for operation on 110 or 220-v ac-dc current. *Ingersoll-Rand Co.*

Circle 78 on postcard for more data

Die-Casting Press Has Automation Features

Cadmium Plating Materials

FOUR new materials for improving cadmium plating were recently announced.

Super XL cadmium brightener (liquid or powder) is an additive agent for cyanide cadmium plating and according to the manufacturer produces the brightest barrel or still cadmium plate yet seen. Only small amounts are needed in the bath. In addition to brightness, it minimizes cadmium usage by improving uniformity of deposit.

Cad-Sol is a concentrated solution of cadmium cyanide for make-up or maintenance of cadmium plating baths without the troublesome task of trying to dissolve cadmium oxide.

Cadip is used in small additions to the final hot water rinse to speed drying and prevent discoloration of cadmium deposits, especially upon baking to relieve hydrogen.

Rodip CD-3 and CD-4 are single, short-dip chromate post-plating treatments without leach, for brilliant cadmium with good corrosion protection. CD-3 is formulated especially for use in automatic tank or barrel installations, and CD-4 is for manual operations. *R.O. Hull & Co., Inc.*

Circle 79 on postcard for more data



TESTING BATH SAMPLES at J. W. Rex Co., ACP-approved processor. All stages of the ACP chemical treatment process are checked by titration at frequent intervals, and the results of the tests logged on ACP technical service data sheets. In this way, ACP technical servicemen and J. W. Rex Co. are able to maintain the baths at optimum concentration for consistently uniform treatment of the metal.

Service keeps ACP chemical processes working smoothly with minimum production slowdowns

What does it take to keep a chemical treatment process working effectively with a minimum of production slowdowns? Service, of course, performed by specialists. We have that kind of service organization — and it's yours for the asking. It's backed by almost 50 years' experi-

ence in the field of chemical treatment of metals. ACP not only supplies the chemicals and the service, it also designs the equipment, develops the process sequence, and maintains a continuing check on the processed metals. Write for complete information about ACP processes.

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FREE LITERATURE

Plastic Tooling 1

A digest of plastic tooling summarizes existing applications for metal-forming and plastics-forming and in foundry practice, and includes material selection data in an eight-page publication. *Marblette Corp.*

Metal Sheet Feeder 2

Described in a six-page brochure is a 150-sheet-a-minute metal sheet feeder, which handles sheets ranging in size from 19 by 19-in. up to 36 by 44-in. and from 38 to 20 gage. *Dexter Folder Co.*

Welders 3

Magnetic force welders and the advantages of magnetic force welding in joining difficult-to-weld critical materials, are presented in six-page Bulletin MF-100 available from *Precision Welder and Flexopress Corp.*

Flexible Couplings 4

Catalog 62, eight pages, covers standard, mill motor and floating shaft dihedral couplings designed to handle angular and offset misalignment up to 12-deg. *Ajax Flexible Coupling Co., Inc.*

Torque Converters 5

Heavy-duty, single-stage hydraulic torque converters for transmission of 100 to 1000 hp to industrial machinery are described in Bulletin 468 available from *The National Supply Co.*

Grinding Wheel Balancing 6

Publication G-637-2, 12 pages, describes a feature on plain, roll and centerless grinding machines for automatically balancing grinding wheels. *The Cincinnati Milling Machine Co.*

Conveyor Safety 7

A four-page folder deals with safety rules that should be followed when installing a conveyor. Different types of units are covered, such as overhead conveyors, belt conveyors, slat conveyors, bucket elevators, etc. *Jervis B. Webb Co.*

Magnesium Dust 8

Methods for collecting and controlling magnesium alloy dust and fumes is the subject of an eight-page brochure issued by *Peters-Dalton, Inc.*

Silicone Rubber 9

The characteristics of general-purpose silicone rubber Silastics 50 and 80, serviceable from -70 to 500 F, and illustrative applications, are contained in an eight-page bulletin. *Dow Corning Corp.*

Blast Cleaner 10

Bulletin No. 607, eight pages, describes the EN-2 blast cleaning cabinet, a self-contained machine for handling small or intermittent work. *Pangborn Corp.*

(Please turn page)

10/1/56

VOID After Dec. 1, 1956

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Plating Machines 11

Features of a line of automatic plating and processing machines are discussed in four-page bulletin issued by *The Udyllite Corp.*

Lubrication Unit 12

Eight-page brochure No. 60-A provides data on spray lubrication systems for open gearing and slide surfaces, including schematic layouts. *The Farval Corp.*

Brush Springs 13

Data on the design of constant-pressure brush springs for rotating electrical equipment is contained in Bulletin 310P published by *Hunter Spring Co.*

Spray Nozzles 14

Over 100 industrial spray nozzles of various types and sizes are illustrated in 28-page catalog 5600 recently issued. Operating principles, capacities, applications, spray angles and other specifications are featured. *Binks Manufacturing Co.*

Lockwasher 15

Four-page folder describes a stamped spring steel lockwasher which features a vibration-dampening grip on the screw thread. *Pioneer Stamped Products Co.*

Thermocouple Insulators 16

Bulletin 300-56, four pages, illustrates and describes a line of thermocouple insulators, including the principal properties of various materials as an aid in selection. *Claud S. Gordon Co.*

Brush Finishing 17

Getting double duty from centerless grinding machines by means of extending their use to precision brush finishing of cylindrical parts, is explained in a four-page brochure. Types of finishing possible and characteristics of the brushes needed are described. *The Osborn Manufacturing Co.*

Pyrometer Indicators 18

Catalog 25-3, eight pages, contains information on various models of a millivoltmeter-type pyrometer indicator which incorporates a permanent magnet moving coil and automatic cold junction compensation. *Thermo Electric Co., Inc.*

Vibration Isolators 19

Bulletin 702, 16 pages, contains engineering data, performance curves, specification tables, a guide to selection, and illustrated application information on plate form and multi-plane mountings. *Lord Manufacturing Co.*

High-Temperature Alloy 20

Described in a new 12-page booklet is Hastelloy R-235, a wrought, nickel-base, aluminum- and titanium-bearing, precipitation-hardening alloy which is said to have outstanding properties through 1750 F. *Haynes Stellite Co.*

Overhead Systems 21

Booklet 2008-M, 12 pages, is a revised edition of engineering and application data on overhead materials handling systems. *Cleveland Tram-rail Div., The Cleveland Crane & Engineering Co.*

Testing Instruments 22

Eight-page Catalog CS-56 contains illustrations and brief descriptions of 37 instruments for testing textiles, plastics, paper, insulation, extensometers, dial indicators, light metals and other materials. *Custom Scientific Instruments, Inc.*

Lathe 23

Bulletin HD-127, 10 pages, illustrates and describes a new 16-in. heavy-duty engine lathe and plain bed gap lathe, including the details of a new headstock which gives speeds up to 2000 rpm. *The R. K. LeBlond Machine Tool Co.*

Packaged Control 24

Pan-A-Trol packaged control for industry is the subject of 12-page Bulletin GEA-6334, which shows typical applications, lists the company services available, and describes the various devices used. *General Electric Co.*

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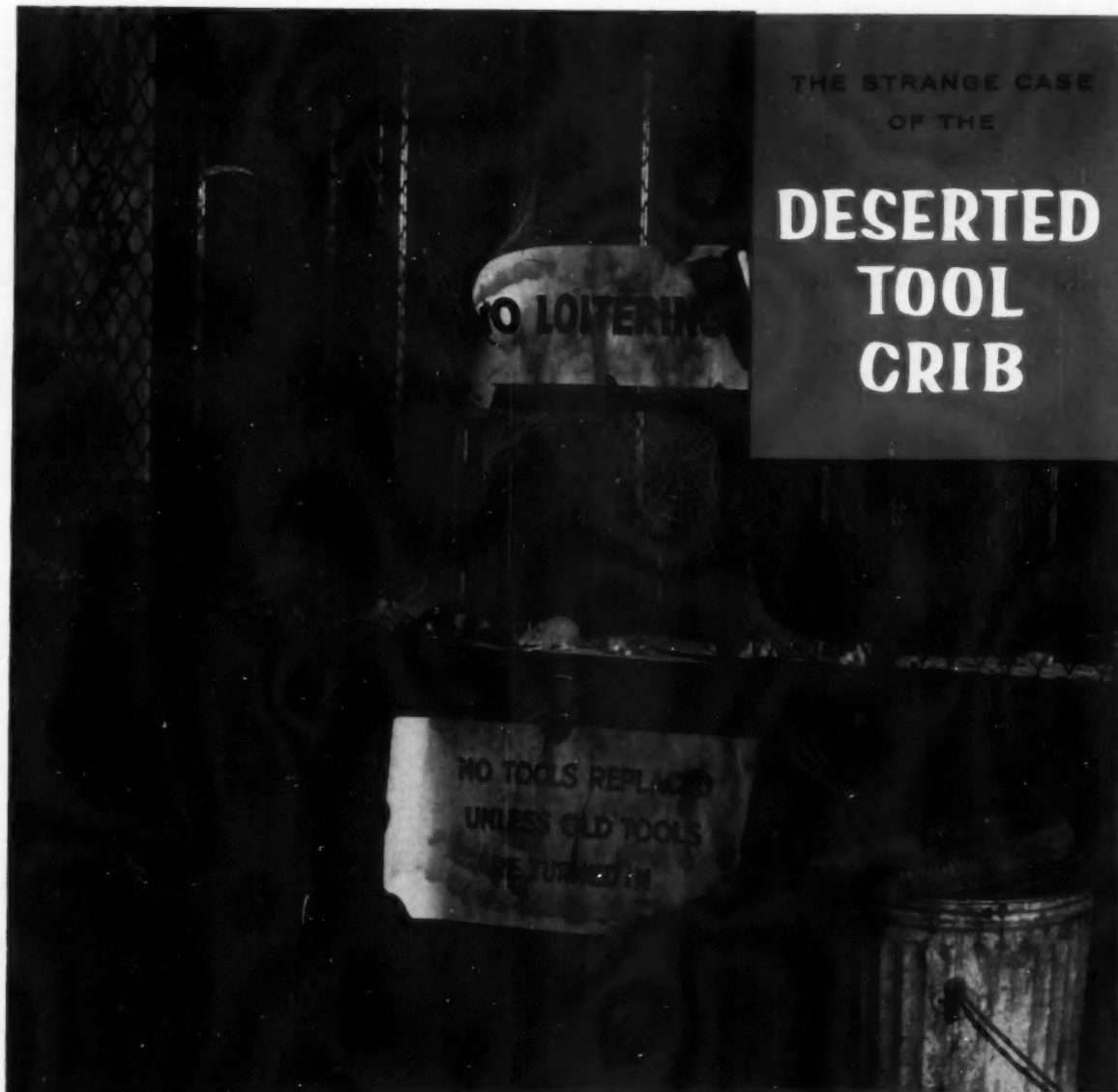
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USE THIS POSTCARD

THE STRANGE CASE
OF THE

DESERTED TOOL CRIB



Once upon a time there was a large manufacturing company that used so many small production tools that they had to operate two tool cribs. These were the busiest places in the whole shop. High-priced machinists spent so much time lined up to replace high-priced worn-out production tools that the personnel department put the coffee machines near the tool cribs. Then business began to fall off in the tool

cribs. No more lines of high-priced machinists. As a matter of fact, one tool crib was all that was needed. Personnel department got worried because the income from the coffee machines was falling off. They decided to find out why one tool crib was deserted.

The answer was quite simple. The production department had started using Copperweld Leaded Alloys. Because of its extreme machinabil-

ity, tools were just not wearing out the way they had been with unleaded steels. In some cases, tools were lasting as much as 10 times as long. The personnel department moved the coffee machine. The production profits from longer tool life, faster feeds and speeds attained with Copperweld Leaded Alloys, made it one of the most important things that had happened in that plant in years.



COPPERWELD STEEL COMPANY
Steel Division • Warren, Ohio

EXPORT: Copperweld Steel International Co., 225 Broadway, New York 7, N.Y.

For further details
on Copperweld
Leaded Alloys,
write for free
booklet, "Lead
Treated Steels."



Plating Machines 11

Features of a line of automatic plating and processing machines are discussed in four-page bulletin issued by *The Udylyte Corp.*

Lubrication Unit 12

Eight-page brochure No. 60-A provides data on spray lubrication systems for open gearing and slide surfaces, including schematic layouts. *The Farval Corp.*

Brush Springs 13

Data on the design of constant-pressure brush springs for rotating electrical equipment is contained in Bulletin 310P published by *Hunter Spring Co.*

Spray Nozzles 14

Over 100 industrial spray nozzles of various types and sizes are illustrated in 28-page catalog 5600 recently issued. Operating principles, capacities, applications, spray angles and other specifications are featured. *Binks Manufacturing Co.*

Lockwasher 15

Four-page folder describes a stamped spring steel lockwasher which features a vibration-dampening grip on the screw thread. *Pioneer Stamped Products Co.*

Thermocouple Insulators 16

Bulletin 300-56, four pages, illustrates and describes a line of thermocouple insulators, including the principal properties of various materials as an aid in selection. *Claud S. Gordon Co.*

Brush Finishing 17

Getting double duty from centerless grinding machines by means of extending their use to precision brush finishing of cylindrical parts, is explained in a four-page brochure. Types of finishing possible and characteristics of the brushes needed are described. *The Osborn Manufacturing Co.*

Pyrometer Indicators 18

Catalog 25-3, eight pages, contains information on various models of a millivoltmeter-type pyrometer indicator which incorporates a permanent magnet moving coil and automatic cold junction compensation. *Thermo Electric Co., Inc.*

Vibration Isolators 19

Bulletin 702, 16 pages, contains engineering data, performance curves, specification tables, a guide to selection, and illustrated application information on plate form and multi-plane mountings. *Lord Manufacturing Co.*

High-Temperature Alloy 20

Described in a new 12-page booklet is Hastelloy R-235, a wrought, nickel-base, aluminum- and titanium-bearing, precipitation-hardening alloy which is said to have outstanding properties through 1750 F. *Haynes Stellite Co.*

Overhead Systems 21

Booklet 2008-M, 12 pages, is a revised edition of engineering and application data on overhead materials handling systems. *Cleveland Tram-rail Div., The Cleveland Crane & Engineering Co.*

Testing Instruments 22

Eight-page Catalog CS-56 contains illustrations and brief descriptions of 37 instruments for testing textiles, plastics, paper, insulation, extensometers, dial indicators, light metals and other materials. *Custom Scientific Instruments, Inc.*

Lathe 23

Bulletin HD-127, 10 pages, illustrates and describes a new 16-in. heavy-duty engine lathe and plain bed gap lathe, including the details of a new headstock which gives speeds up to 2000 rpm. *The R. K. LeBlond Machine Tool Co.*

Packaged Control 24

Pan-A-Trol packaged control for industry is the subject of 12-page Bulletin GEA-6334, which shows typical applications, lists the company services available, and describes the various devices used. *General Electric Co.*

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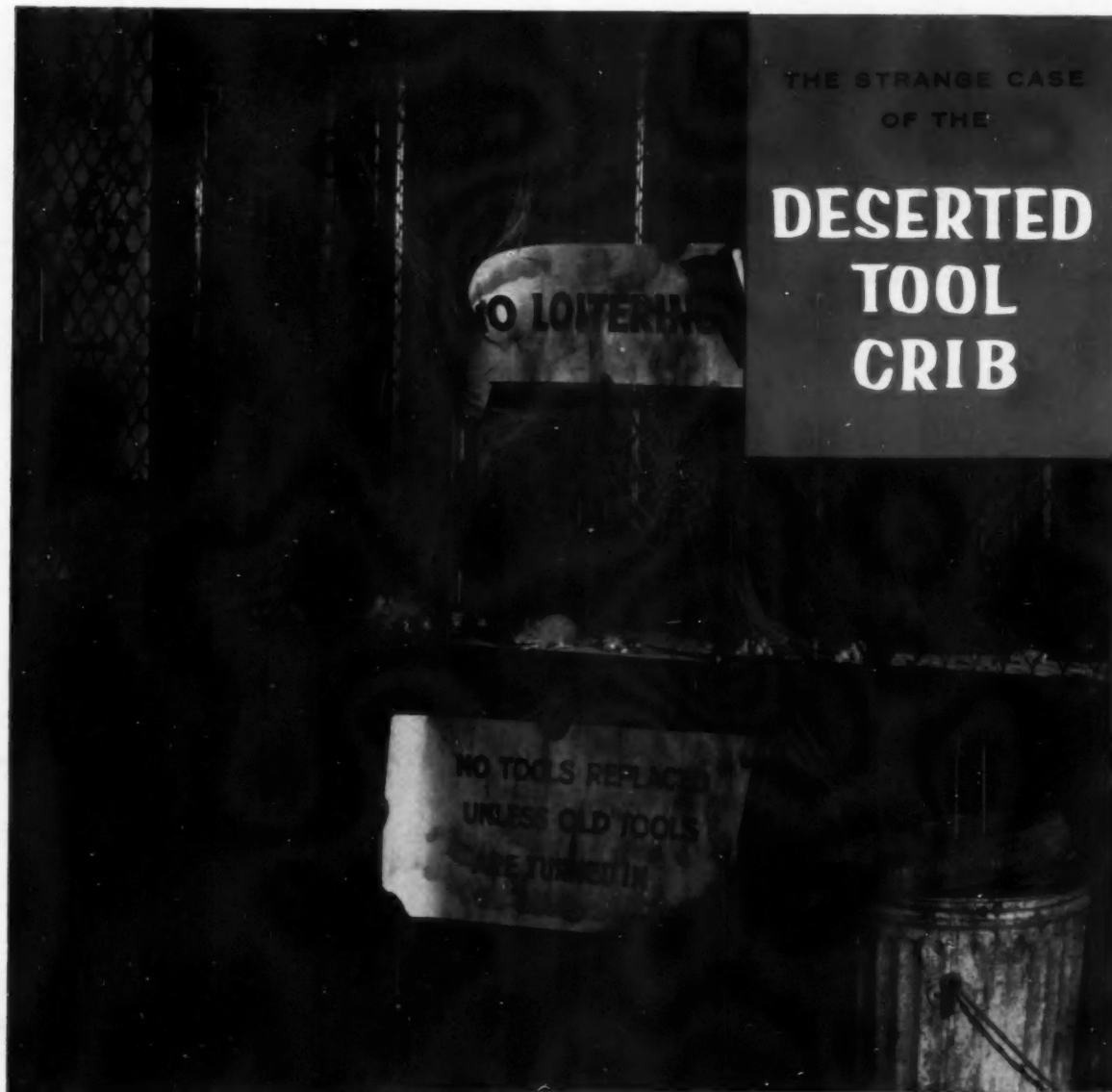
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THE STRANGE CASE
OF THE

DESERTED TOOL CRIB



Once upon a time there was a large manufacturing company that used so many small production tools that they had to operate two tool cribs. These were the busiest places in the whole shop. High-priced machinists spent so much time lined up to replace high-priced worn-out production tools that the personnel department put the coffee machines near the tool cribs. Then business began to fall off in the tool

cribs. No more lines of high-priced machinists. As a matter of fact, one tool crib was all that was needed. Personnel department got worried because the income from the coffee machines was falling off. They decided to find out why one tool crib was deserted.

The answer was quite simple. The production department had started using Copperweld Leaded Alloys. Because of its extreme machinabil-

ity, tools were just not wearing out the way they had been with unleaded steels. In some cases, tools were lasting as much as 10 times as long. The personnel department moved the coffee machine. The production profits from longer tool life, faster feeds and speeds attained with Copperweld Leaded Alloys, made it one of the most important things that had happened in that plant in years.



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NEW

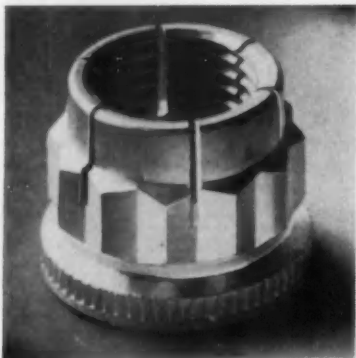
PRODUCTS

AUTOMOTIVE-AVIATION

FOR ADDITIONAL INFORMATION, please use reply card on PAGE 97

New Self-Locking Nut

Flexloc self-locking locknuts for use at elevated temperatures up to 1200 F, have been introduced. Designated 119FW and intended primarily for aircraft use, they are said to have the high temperature and cor-



rosion resistance necessary to maintain tensile strength and resist galling and seizing after sustained exposure to high temperatures. The one-piece, all metal locknuts, which have a 12-point external wrenching design, can be used in jet engine manifolds, afterburners and similar hot-spot applications.

A prevailing-torque type of locknut, the new Flexloc has a slotted locking collar which is squeezed in slightly during manufacture. As the nut is threaded onto a bolt, the collar segments expand. Spring tension of the segments holds the nut securely in place. This design lets it serve as either a stop nut or locknut and permits re-use of the fastener.

The 119FW locknuts come in standard sizes from #10 through 1/2-in. diam. They are made of AMS 5735 stainless steel and are silver plated.

Standard Pressed Steel Co.

Circle 90 on postcard for more data

Trim Materials

Announcement has been made of a new process called Custom-Rold for the production of unusual patterns in

Rigid-tex metal. By this method it is possible to roll many of the company's standard patterns in prescribed areas, leaving the remaining portions of the sheet plain. Unusual effects can reportedly be obtained by rolling the patterns in bands separated by bands of plain metal. These stripped patterns make attractive trim material, either in stainless steel, aluminum or other metals. Other arrangements of patterned and plain areas are available; for example, areas left plain or rigidized can be in a geometric arrangement and can be shaped to simulate a trademark or design.

Rigidized Metals Corp.

Circle 91 on postcard for more data

High-Strength Alloy

A comparatively-new vacuum-melted nickel-base alloy, called M-252, is proving to be suitable for extended operation under load at temperatures of 1240 F, according to a recent announcement. Already being used in the form of forged buckets in the first stage of heavy-duty land gas turbines produced by the company, the alloy is reported to exhibit high rupture strength, good fatigue strength and high resistance to thermal shock.

Metallurgical Products Dept., General Electric Co.

Circle 92 on postcard for more data

Industrial Adhesives

Industrial adhesives, in a new line, are said to be capable of bonding a large variety of materials, to be resistant to low and high temperatures, and to be applicable by commonly-used methods. Comprising both thermosetting and thermoplastic types of adhesive compounds, the products will be marketed under the trade name Ray-BOND.

With the line of adhesives, manufacturers can make a selection from a variety of compounds for bonding and lamination operations.

The thermosetting adhesives are

said to offer excellent bonding qualities and heat stability. Compounds are based on synthetic or natural rubber, resin bases of all types, and combinations of rubbers and resins. Ability to resist temperature extremes ranging from -80 deg to as high as 700 deg F make these adhesives desirable for extreme temperature applications.

The various materials with which the adhesives can be used effectively for bonding, coating or sealing include wood, metal, plastics, glass, ceramics, friction material compounds, leather, paper, insulation materials, rubber, and cork. In service, they offer resistance to most oils, solvents, gas, water, and temperature extremes.

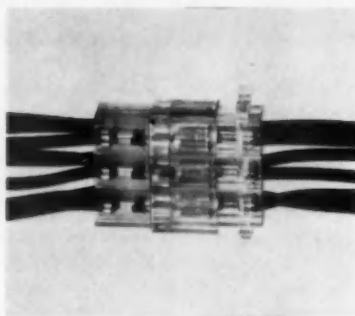
Application techniques include use of spray, pressure flow systems, brush, roller coat and manual application.

Raybestos-Manhattan, Inc.

Circle 93 on postcard for more data

Harness Connector

Designed to provide simultaneous engagement of multiple circuits, a new type harness connector is said to



simplify the connection of front and back assemblies in automotive electrical systems. In using the easy-to-apply Faston terminals, the Fastin-Faston harness connector can accommodate as many as six input and nine output leads.

Aircraft-Marine Products, Inc.

Circle 94 on postcard for more data

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*Studebaker...like many other leading engine manufacturers
selects and distributes...for authorized replacement service*

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2 in 1 chrome piston rings...the standard of comparison

Chrysler Corp. Cars for '57

(Continued from page 48)

1957. All four-door nine-passenger Suburbans will have a rear facing third seat with entrance from the rear. The spare tire will be mounted in the right rear fender in these models.

Chrysler Division has many surprises for 1957. Among them are: completely new body styling, with recessed door handles; an aluminum front grille; aluminum-frame window openings in Saratoga and New Yorker sedans; optional dual headlamps; more glass area; and optional six-way power seats. From a mechanical standpoint, the most important feature is the new front suspension system.

The 1957 line consists of three model series—the new Chrysler Windsor; the Saratoga; and New Yorker. Body types in these series are as follows: Windsor: four-door sedan; two-door and four-door hardtop; and a two-seat, four-door suburban. Saratoga: four-door sedan; two- and four-door hardtops. New Yorker: four-door sedan; two- and four-door hardtops; convertible; two-seat, four-door station wagon.

The Chrysler 300C, a special two-door hardtop, and a convertible coupe, will be available in the line. Distinctive performance is based upon a modified Fire-Power engine equipped with two, four-barrel carburetors, mounted on a special double-runner intake manifold. The camshaft is designed for improved valve operation at high speeds, but with relatively smooth idle. Solid tappets, rather than hydraulic valve lifters, are employed to avoid "pump-up."

This model normally is equipped with the Torque-Flite transmission and manual steering. For some special requirements, however, it will be equipped with a manual shift transmission. Power steering is optional.

The chassis frame is new with straight through side rails of box section to offer maximum torsional rigidity. It has two front cross members—the forward one for bumper and radiator support, as well as front suspension strut attachment; the rear one is for engine and torsion bar suspension support.

Front-end harshness is reduced and less road noise is transmitted to the car by virtue of the completely rubber-insulated steering and suspension system. In addition, harshness originating from vertical wheel movements has been practically eliminated by

attaching the front sway bar to the frame with a flexible hanging hinge.

Finally, Chrysler has introduced a lower control arm strut, cushioned in rubber, to permit a slight fore-and-aft movement of front wheels. Severity of road shock due to sharp bumps and holes is thus reduced. Rear springs now are attached outside the side rails, extending the support for the frame and body on the rear axle.

FirePower and SpitFire engines have been made more powerful than before by increases in displacement, compression ratio (to 9.25 to 1), and by other changes. Displacement of the FirePower New Yorker engine has been upped to 392 cu in., by increasing bore to 4.0 in. and stroke to 3.9 in. Intake valve diameter has been increased to 2 in.

Displacement of the SpitFire engine for Windsor and Saratoga models has been upped to 354 cu in. by enlarging the bore to 3.94 in. Diameter of intake valves is upped to 1.94 in. A slightly domed piston contributes to the change in compression ratio.

New camshafts improve fuel-air mixture flow. Cam lobes are designed to open and close the valves more rapidly for improved high-speed performance. Adoption of shear-type, spool-shaped front engine mountings is said to result in reduced shake, less noise, and less for-and-aft engine movement.

The three-speed Torque-Flite automatic transmission is an improved version of the unit introduced earlier on 1956 Imperial cars. On the New Yorker, it has a torque converter with torque multiplication of 2.3 to 1; on Windsor and Saratoga cars, torque multiplication is 2.6 to 1. The pushbutton control for this drive has five buttons.

A new sleeve type power steering pump with higher capacity at low or idle speed has been adopted. Mounted at the front end and driven by belt from the crankshaft, it operates at a lower speed than before, thus reducing noise level.

The pump consists of two cylindrical blocks assembled in a body with the center lines inclined 30-deg to one another. Similarly located holes in each block are interconnected by nine free-moving sleeves, also bent 30 deg at the center. Since the blocks are connected by the sleeves, rotation of one block will cause rotation of the other to produce relative motion be-

tween the sleeves and the blocks. The volume of the cavities at the ends of the sleeves is thus increased or decreased. Porting in the end plates is so arranged that cavities with increasing volume are exposed to the pump intake, while cavities of decreasing volume are connected to the outlet.

The Chrysler Imperial family is distinctively styled for 1957 with sweeping tail fins, double wraparound windshield, curved side glass to complement the "tumble home" treatment of the upper body structure, aluminum upper door frames, Landau-type roof on hard-tops, and aluminum grille. Dual headlamps are available as optional equipment. In addition, a special rear deck lid with a molded spare tire impression is optional.

The line-up of models is as follows: Imperial two- and four-door hardtop; four-door sedan. Imperial Crown: two- and four-door hardtop; four-door sedan; convertible. Imperial LeBaron: four-door sedan only. Basic mechanical features are substantially the same as described in the Chrysler line.

New Four-Barrel Holley Carburetors

(Continued from page 53)

Hot starting difficulties have been minimized by exposing the two fuel bowls to the air stream. This aids in cooling the fuel in the float chambers, preventing percolation and hard starting when the engine is hot.

Carburetor Models 4150 and 4150-G are composed of three major sub-assemblies. They are the fuel bowls and metering bodies assembly, the main body assembly, and the throttle body assembly.

The die cast fuel bowl and metering body assembly contain the fuel bowl, fuel inlet needle valve, float, and all of the fuel metering jets.

The die cast main body assembly contains the choke plate, secondary diaphragm, venturi, boost venturi and various fuel and vacuum passages. Model 4150 has, in addition, an automatic choke, while the Model 4150-G has a Centri-Vac governor.

The die cast aluminum throttle body assembly consists of the throttle plates, throttle linkage, and various fuel and vacuum passages. A dash-pot is also included for automatic transmission vehicles.

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for simultaneous engagement

of multiple circuits

in appliance and automotive wiring

A new highly versatile assembly unit that makes one operation out of many. Saves time, trouble, money.

Simplifies such operations as the connecting of wall switches to built-in ranges . . . top with bottom circuits in clothes washer . . . front and back assemblies to car electrical systems.

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*TRADEMARK

Observations

By Joseph Geschelin

Suspension Systems

By the time the results are in on 1957 models, it will be found that great changes have been made in suspension systems. We shall find torsion bar suspensions at the front, variable rate coil springs at the front, ball joint suspension on most makes, and some with variable rate rear leaf springs. At least one make will have a special rubber suspension for the front end of the rear springs.

Keyhole Peeping

Most people like to read about pending developments in new cars. And many newspapers and magazines try to feed this craving. In our operation we are duty bound to maintain secrecy about the things we are shown as a matter of courtesy by the car makers. So we can't say much about these things. We do hope that someone with more time than we have would keep a record of predictions and check it against the final record.

Skilled Workers

There is growing evidence that manufacturing plants need well trained men capable of troubleshooting and repairing hydraulics systems, electrical and electronic systems, and the other devices such as programming equipment that predominate the automotive scene. These matters have been the subject of much discussion in recent years. But positive action is needed right now. It means special training for people with proper aptitudes. Some of the training will be done and is being done by individual suppliers of machine tools and accessories; some is being done in special schools. However it is done, the fact remains that trained men are needed with a high level of specialization that needs must set them apart from the usual production worker.

Hydraulic Brakes

A foreign inventor visiting us recently disclosed the details of a simple accessory device for the hydraulic brake system. It is arranged to sense a drop in pressure in the brake line and will cut off flow of fluid to either the front or rear brakes, depending upon the location of a leak or break in the line. This will prevent leakage of fluid from the system, make it possible to make a stop at least on two wheel. At the same time a tell-tale light on the instrument panel will warn the driver of an emergency. We have not been conscious of any serious problem with respect to failure of brake pressure lines. However, here is a possibility of adding a safety feature that may well justify the cost of the installation.

Automation Advances

Whether you call it automation or something else the applications of automatic feeding, loading, and unloading are growing. One of the new plants we visited recently is more fully automatic than anything we have seen to date. We have little doubt that many surprises are due when Ford has its Lima engine plant readied for production. Latest development is the automatic operation of complete gear lines. This has been accomplished in several plants but nothing like the setup to be unveiled toward the end of this year.

Ceramic Tooling

Most of the applications of ceramic tooling cited to date are experimental. However, one of the large manufacturers has a regular production job that has shown dramatic promise. It still has some difficulties that have to be eliminated. But we expect to get final details in a couple of months that will be a revelation to machine shop operators.

Linear Accelerator

One of the suppliers to the industry will unveil in a few months a new linear accelerator installation, said to be the highest capacity machine of its kind for industrial uses. One of its principal functions will be to study the effects of nuclear bombardment on plastics and metals. Once it has been set up the equipment will be available as a research tool for serving automotive manufacturers. We will have the details by the end of the year.

Wheels, Brakes

It is obvious now that 14-in. wheels will not be used across the board. There are special reasons for this in each instance. Our own opinion is that on some of the larger cars there is hesitance in changing the present brake system. A great deal must be done with brakes before the 1958 model season to accomplish a switch to 11-in. brake drums.

Fuel Injection

We doubt whether fuel injection will be as prominent on 1957 models as was intimated by the press in recent months. A distinction must be made between the fuel injection system and the pressure carburetor system. They are entirely different ways of accomplishing the end result.

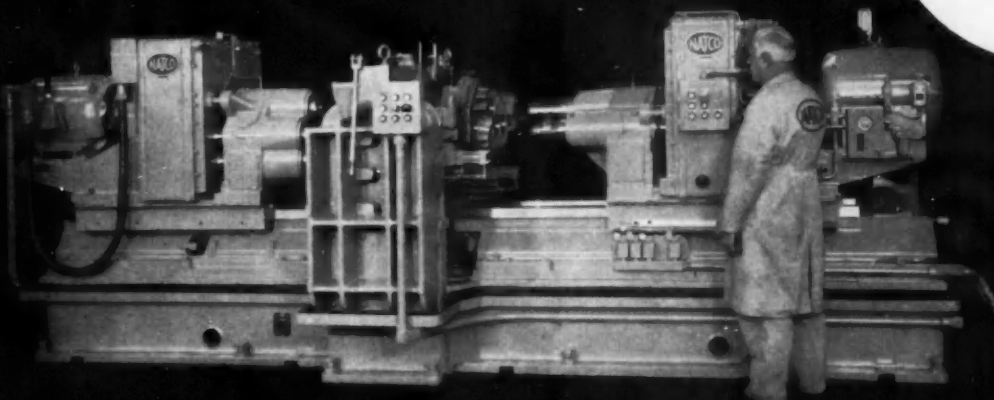
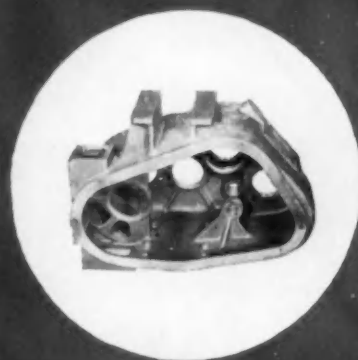
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MANUFACTURING

Natco[®] Automatic Matches Boring Mill Accuracy

and quickly converts for five different jobs



This Natco two-way machine stepped in where automatics "fear to tread!" It replaced a precision boring mill, speeded production and didn't give up a tenth in accuracy! At The Frank G. Hough Co. boring mills were used for exacting tolerances on transmission parts for the Hough Payloader[®]. Higher production was desired.

Now with a Natco two-way automatic, Hough is getting production rates—not job shop rates. The Natco bores diameters to within .0005"—square with mounting face within .0005" per inch bore length. The machine also chamfers, counterbores and notches boss contours.

Versatile too! Hough processes five different transmission housings or covers with a single machine. After a typical production run averaging 100 parts, the machine is quickly converted to another job.

Ask for information about the PAYD (Pay-As-You-Depreciate) Finance Plan.

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Using

METALS

Effects of Steel Strike Will Be Felt for Months as Many Mills Are Cutting Back on Orders for Fourth Quarter of the Year

By William F. Boericke

Fast Recovery from Steel Strike

By mid-September the steel makers had made amazing progress in recovering from the five-week strike. Production had risen to over 100 per cent of rated capacity, calculated to produce 2,463,000 net tons of ingots and castings. The operating rate indicated is based on annual capacity of 128,363,000 tons.

Nevertheless the effect of the strike will be felt for months. Because many producers had anticipated a let-down in demand for the third quarter, foreign orders had been accepted that producers now wish were off the books. The loss in production totals about 11-12 million tons. This loss can't be made up, consequently many mills are cutting back on orders for the fourth quarter.

Users of structural steel are in a critical position and it is anticipated that only structural orders received in July and August can be delivered during the rest of the year. The list of tight products now includes hot rolled bars as well as plates and pipe. Hot rolled sheets are booked well into 1957. Cold rolled sheets, formerly in relatively plentiful supply, are now on priority lists.

Higher Costs Have Not Affected Demand

High operating rates are expected to continue for months ahead, for although steel demand from the automobile industry is still far from spectacular, a marked increase in orders has been noted. It does not appear that rising prices or tight money are going to slow down the boom in capital goods. The expansion program on the books for heavy industries is long range and current advances in money rates will have little significance in causing any cancellation of plans. Steel consumers will be anxious to build up inventories once more when opportunity is presented in order to hedge against higher steel prices that will be effective after July of next year, when higher wage rates will automatically be put into effect.

The \$8.50 per ton across the board increase in steel prices is not considered enough by some producers to compensate for higher scrap prices and anticipated higher freight rates, as well as the increased wage scales. While damage to furnaces was relatively light

during the strike period because of better shut-down technique, nevertheless it can't be entirely overlooked. Also, a hike in the price of iron ore is expected early in 1957. Prices were raised eight per cent early in 1956, and traditionally hold firm for the rest of the year. The tie-up in shipping on the Great Lakes ended in September but about 10 million tons of ore were lost to the blast furnaces.

Steel Scrap Very Strong

Soaring prices for steel scrap have met resistance from the mills but no decline is expected until the end of September, if then. Premium grades went to over \$60 per ton in Chicago. This compares with a low price of \$45.50 during the strike. A heavy export demand is partly responsible for the market strength. A single order for 60,000 tons came from Japan. Industrial scrap supply is off and quite understandably, as less has been obtained from Detroit.

Raw steel is definitely in short supply and in the gray market ingots have been offered at \$100 per ton, a 40 per cent premium over mill prices. Such offers have come from some operators of small electric furnaces who have had to pay high prices for scrap.

Tin plate prices were raised a small amount for the fall and winter season. Such prices are effective for six months. Tin plate represents about eight per cent of total steel shipments. An interesting instance of the shortage of raw steel was the decision of an important manufacturer of steel strapping to acquire the facilities of a semi-integrated steel producer in order to supply its own finishing mills and avoid the need to pay premium prices for half of its requirements.

Copper Still Unsettled

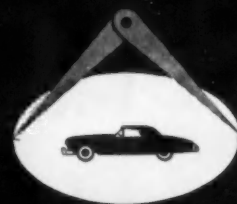
Copper demand has improved but still leaves much to be desired. The trade has been hot and cold over the price outlook as the danger of a strike loomed at the important Garfield smelter of Utah Copper. Fortunately this was settled, and the troubled labor situation in Rhodesia threatened interruption to that important source of supply to Britain.

There was not much pick-up in copper sales following settlement of the steel strike. It appears that there must be a real increase in automobile production and the relatively low rate of residential construction before a strong copper market will be witnessed. Fabricator stocks are rather uncomfortably

(Turn to page 108, please)

DU PONT ELASTOMERS

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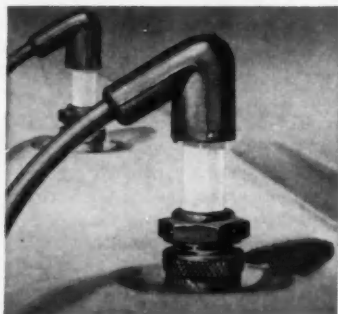
in Design

HYPALON® solves some heat and ozone problems for resilient materials

HYPALON is completely unaffected by ozone, and, when it is compared with other kinds of rubber, it also shows unusual resistance to hardening at elevated temperatures (250°-350°F.). These two facts offer new opportunities to design engineers who are faced with the problem of using resilient materials in today's high-powered engines.

Already HYPALON is being used in molded spark-plug boots (see photo below) and ignition cable jacketing. In these applications, HYPALON's superior resistance to heat, plus the fact that it is completely unaffected by ozone, makes it a logical choice. HYPALON is the most economical choice in the long run, too, because it gives an extra-long service life to any product exposed to heat and ozone.

HYPALON has many other uses in the automotive industry. It's being used as a protective coating on rubber door stripping for automobiles because it protects against deterioration by sunlight and weathering. Durable HYPALON also can be compounded in an unlimited range of *light-fast* colors to blend with the modern fabrics and exterior paint colors of today's cars. These are just a few examples. For further information on HYPALON, just mail the coupon.



MOLDED spark-plug boots of HYPALON withstand high temperatures, are unaffected by ozone.

NEOPRENE - nylon diaphragm solves oil deterioration problem for Fifth Ave. Coach



NEOPRENE-nylon diaphragm (a) is still in good condition while cotton-natural rubber diaphragm (b) is worn out. Close-up shows raised seals (c) that prevent air leakage around bolt holes.

Neoprene chosen as standard for air-brake diaphragm

After extensive road testing on some of its toughest routes, Fifth Avenue Coach Lines, Inc., operator of some 1,300 buses in New York City, has standardized on a new brake diaphragm made of neoprene reinforced with nylon fabric.

The company formerly used natural-rubber diaphragms reinforced with cotton fabric. In these diaphragms there were two principal kinds of failure. Oil in the air supply softened and blistered the rubber, and push rod overtravel tore the fabric. The company decided to try nylon instead of cotton, and neoprene instead of natural rubber.

At the end of 18 months, during which 200 neoprene-nylon diaphragms

had been tested, company engineers found that not a single diaphragm had been deteriorated by oil and that the nylon reinforcement was still intact. Average life—about twice that of the old cotton-rubber diaphragms.

Designing with neoprene

Unlike ordinary resilient materials, neoprene *retains* its basic rubber-like characteristics despite exposure to grease, oil, heat and weathering. This makes it ideal for an almost unlimited number of automotive uses . . . in gaskets, trim, hose and tubing, ignition-wire cover, couplings, seals, door strips and other places. To determine how you can best profit by a proper application of neoprene, clip and mail the coupon below.



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Increased Tractor Versatility

(Continued from page 65)

Row Crop Type Tractor

The row crop type agricultural tractor is not suited for backhoe and loader operation. The standard tread type tractor has a lower center of gravity and improved stability. It usually has larger tires and more rugged axles, but does not provide the attachment points necessary for mounted equipment or for hydraulic pump installation. The demand for both backhoe and loader mounted on small track type tractors is continually increasing. Track type tractors provide the increased traction and flotation often necessary for earth moving jobs. They are also more maneuverable than the wheel type tractor; however, they do have the disadvantage of being more difficult to transport between job sites. The "utility type" tractor now produced by most tractor manufacturers is more suitable for industrial work.

Utility Type Tractor

Considering all types and classes of agricultural tractors the small utility type tractor is the best suited and has become the most popular prime mover for backhoes and loaders. Although all have the same general design, each model presents its own particular problem to the allied equipment manufacturer.

The following are some of the problems that developed in mounting the loaders and backhoes on 12 different tractor models: Four different models of loader frames are necessary to fit all of the 12 tractors. Of all items on the engine which require frequent service the battery and the oil bath air cleaner have been the most difficult to keep accessible. In spite of the fact that the utility type tractors were designed for industrial as well as agricultural use, many of them fail to provide the mounting surfaces and bolt holes necessary for heavy mounted equipment. Many industrial applications require the use of a hydraulic pump larger than that furnished with the tractor, yet very few tractor designs have given this due consideration.

Tractor Breakage

Considering tractor breakage when a backhoe is attached, B. F. Chapman, of Pippin Construction Co., told

of a temporary solution. In many instances it involves a full length, rigid subframe attached to the front and rear of the tractor, which helps to dissipate the complex combination of stresses applied by the many movements of the backhoe during the digging cycle and in transport. This has been accomplished with considerable additional cost to the mounting kit, and to the selling price of the combined tractor-backhoe combination.

A first consideration would be strengthening of the tractor's main castings—differential, final drive and rear axle housings, transmission cases, front axle supports, etc.—to the point where such expensive mounting frames may be eliminated. In considering the backhoe in any redesign program, besides the strains applied by the digging, lifting and swinging of the backhoe cycle, there is another fact which must be kept in mind. A combination piece of equipment is required on the front of the tractor as a counterweight. This accentuates the stresses on the tractor and further complicates the designers' problem. Another consideration in the strengthening of castings would be the advantage of wider tread of the rear wheels for greater stability with digging equipment. The constant demand for more swing and greater digging arc makes this more imperative for the security of the operator. The sales resistance to a digging unit which is unstable is practically insurmountable. A standardization of mounting points would be our next ideal, along with a tractor hydraulic system of sufficient capacity to take care of the larger equipment such as backhoes.

METALS

(Continued from page 106)

high. The total held by brass and wire mills at the end of July was at the nine-year high of 465,000 tons compared with 312,500 tons a year earlier.

Plain talk was given by Kennecott Copper Corp. to its workers before the threatened strike. They were told that the copper industry, unlike steel, could not pass on higher labor costs

by raising metal prices, as copper must compete in the world market with foreign suppliers.

Brass fabricators are still stuck with high priced metal they bought during the period of high markets. Some are still working off 50 cent copper—or trying to. The big producers refuse to sell copper at a fixed price for future delivery and won't set a price until the metal is actually shipped to a consumer. The fabricator is uncertain what the metal will cost him then. It's true that he can also price his product on the same basis, but this overloads the delay incident to fabrication and in the interim the market may decline.

Zinc Shipments Recover

Zinc statistics for August showed a sharp recovery in domestic shipments which leaped to 70,700 tons for the month against half that amount in July when the steel strike sliced demand from the galvanizers. But production mounted to 89,500 tons and if the Government had not obligingly taken over 16,000 tons for the stockpile, stocks would have established another high record. As it was, they remained about the same, over 104,000 tons at the month's end. Unfilled orders were slightly larger.

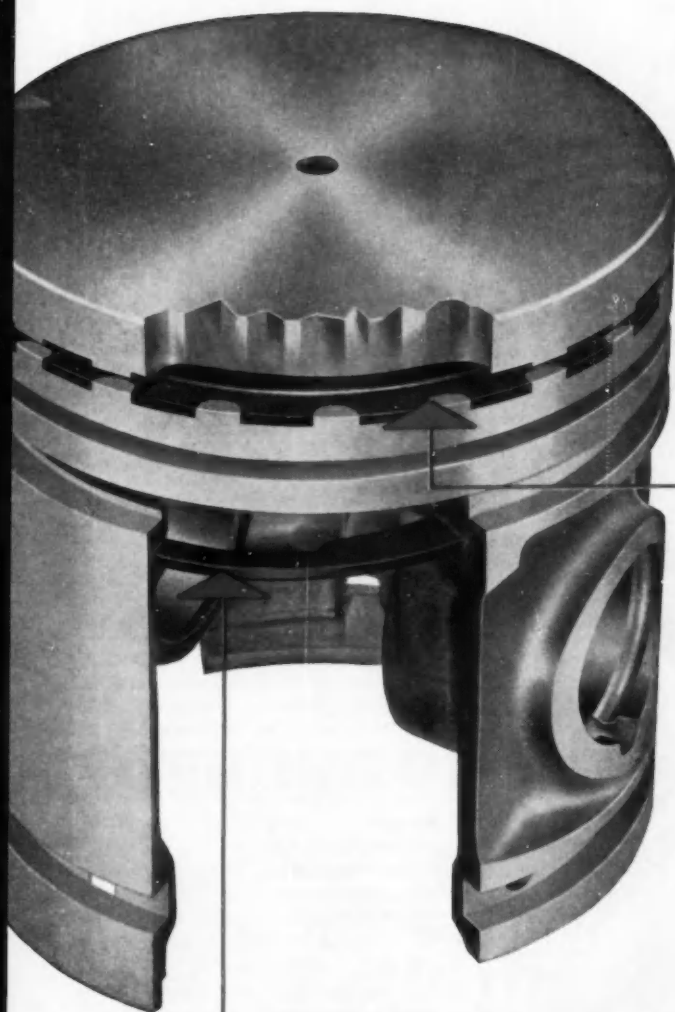
The situation is not particularly good but does not cause alarm, although Detroit buying of Special High Grade for die castings has not reached expectations. Slow business for the brass fabricators holds down demand for zinc from that industry as well. But few expect any price change, and the Government can be relied upon to take up the slack until demand improves. A big tonnage was offered Washington under the barter deal and this of course relieves pressure on the market by foreign producers. London opinion is that the zinc price is too high.

Aluminum Demand Less Urgent

Further plans for expansion of primary aluminum production in this country, as well as in Europe and Africa, have been reported. Aside from announcement that Revere Copper and Olin Mathieson will jointly erect a 60,000-ton primary plant, large projects are announced abroad in Yugoslavia, India, and the Congo. The Aluminum Association reported that primary production in the U. S. reached an all-time high for the first seven months of this year with 1,011,900 tons of metal.

NOW!

STERLING CONFORMATIC* PISTONS



CONFORMATIC STEEL CONTROL MEMBER, anchored at the pin bosses only, controls skirt clearance... hot or cold! The metered steel insert allows you to specify the piston clearance you want for your engine. (Clearances from zero to 1/2 thousandth inch are generally recommended.)

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available with
LOW COST

Intra-Cast* STEEL-LINED

GROOVES

Steel protection—top and bottom—gives sensationally longer life to rings and grooves.

This ring is *integrally cast* into the piston... positioned so that when the grooves are machined, the top ring groove is *lined with steel* and has islands of aluminum for ring cooling. This Intra-Cast steel-protected groove resists enlargement and materially reduces top ring land wear and rounding. And, it does it at far less cost than other methods.

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STERLING ALUMINUM PRODUCTS INC.

ST. LOUIS, MISSOURI



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TORRINGTON NEEDLE BEARING *costs!"*

Initial cost of the Torrington Needle Bearing is much less than that of any comparable anti-friction bearing. But economy in first cost is only the start of savings which accrue to users of the Needle Bearing.

Because of its unit construction and small size, housings and related members can be made smaller and lighter.

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Throughout the life of the completed assembly, the Torrington Needle Bearing continues to pile up benefits. Low

friction, high load capacity and retention of lubricants all contribute to the characteristically long service life of Needle Bearings.

For twenty years, our Engineering Department has helped designers and manufacturers throughout industry to adapt the unique advantages of the Needle Bearing to their products. Let us help you make the Needle Bearing "standard equipment" in yours.

See our new Needle Bearing Catalog in the 1955 Sweet's Product Design File—or write direct for Catalog No. 55.

THE TORRINGTON COMPANY
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**TORRINGTON
 NEEDLE BEARINGS**
Give you these benefits

- low coefficient of starting and running friction
- full complement of rollers
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- runs directly on hardened shafts
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RANSBURG *Electro-Spray* DOES IT BETTER... FOR LESS



50%

INCREASE IN PRODUCTION

50%

SAVINGS IN LABOR and OVERHEAD

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CUT IN PAINT COSTS, with improved, more uniform, and higher quality finish.

The job—flat sheet steel, 11" x 19"—enamel coated to withstand a 90 bend with sharp radius. Full coat one side; mist coat other.

WITH RANSBURG ELECTRO-SPRAY BY FORMER HAND SPRAY

Output, 375 panels per hour with 3 men

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Labor and overhead06

Paint & lease cost017

TOTAL COST077

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Paint cost044

TOTAL COST164

Want to know what Ransburg Electro-Spray can do for you in YOUR finishing department? Write for our new No. 2 Process brochure. It tells the WHAT & HOW of electrostatic spray painting, and with numerous production-line examples, shows how other manufacturers are cutting finishing costs... increasing production, and improving the quality of their work with Ransburg equipment. Too, we have available now a new movie, "The Big Attraction," a 27-minute sound and color film on electrostatic spray painting.

Ransburg

ELECTRO-COATING CORP.

Indianapolis 7, Indiana

RANSBURG

SEE the Ransburg No. 2 Process RECIPROCATING DISK ATOMIZER in operation at the METAL SHOW — BOOTH 1714

Look what Ransburg Electrostatic Spray painting is doing in this eastern job shop, the Del-Val Finishers Division of J. W. Rex Company, Lansdale, Pa.

As a job shop, Del-Val handles a variety of work each month, painting hundreds of thousands of pieces and parts of various sizes and shapes.

The versatility and flexibility of Ransburg Electro-Spray makes it ideal for their varied painting requirements. Here's a typical example. Del-Val recently completed a contract for a Philadelphia manufacturer of barbecue trays with these results:

Dakota replacement market.

There were no new helicopters, but more information was gleaned about the 17-ton Fairey Rotodyne which is scheduled to fly next spring. This large machine, capable of carrying 40 passengers or 11,000 lb payload more than 400 miles, is powered by a pair of Napier Eland turboprops. The engines mounted on the stub wings give forward propulsion, while the 90-ft diameter rotor is driven by jets in the blade tips. Fuel is burnt in the compressed air exhausted through the jets to give maximum torque for hovering. Maximum speed is stated to be 170 mph, rate of vertical climb 1670 fpm, and direct operating cost 3¢ per seat-mile.

A new item in the equipment section was the Plessey ram air turbine, designed as an emergency power unit for maintaining essential services in an aircraft in the event of engine or component failure. Fitted with a hydraulic pump, the unit weighs 18 lb and delivers 4½ gallons per minute at 3000 psi at speeds of 150 to 210 mph. It is normally concealed in the airframe, but can be swung outwards either mechanically or by hand.

Wiring cable for high-temperature operation was introduced by British Insulated Callender's Cables. This is claimed to have withstood a five-minute test at 1100 deg C with no breakdown between conductors at 240 volt ac, and to operate continuously and remain flexible at temperatures between -50 deg C and 240 deg C. It is made up of standard copper wire, nickelplated to prevent surface oxidation, composite insulation with good fire-resistant properties, and an overall glass braid treated with special plastic lacquer.

Bristol exhibited large spherical high-pressure gas storage vessels fabricated from resin-impregnated glass fiber. During manufacture, the threads of fiber are brought together to form a ribbon which is wound on the former to build up the final sphere.

BOOKS...

ASTM STANDARDS ON ENGINE ANTIFREEZES, published by American Society for Testing Materials, 1916 Race St., Philadelphia 3, Pa. Price, \$1.50. This compilation, prepared under the sponsorship of Committee D-15 on Engine Antifreezes, contains 11 standards—nine test methods and two specifications. Included in the contents are methods for sampling, methods for determining freezing points, physical testing, chemical testing, and specifications for thermometers and for a hydrometer-thermometer field tester.

NEW !

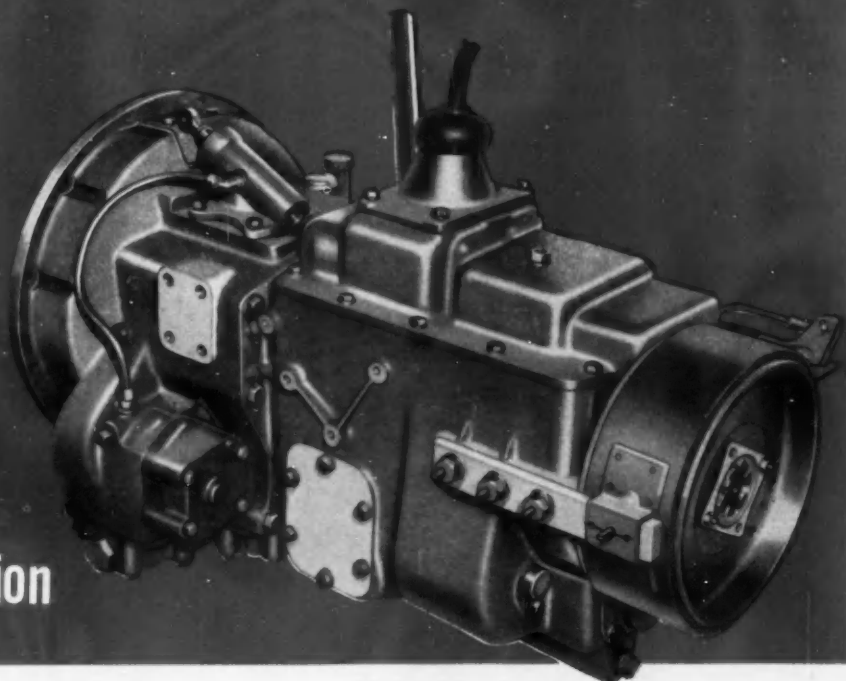
the CLARK TransVerter

COMPACT
UNIT
"PACKAGE"
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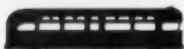
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Now comes more profitable performance for the operators of stop-and-go vehicles—trucks, both highway and off-the-highway, garbage and trash collectors, concrete mixers, materials handling machines and others: smoother, more economical handling made possible by Clark's new TransVerter.

- No heavy clutching—reduces driver fatigue. Easy control of hydraulic clutch by shift lever button, floor button, or light pressure clutch pedal
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PREVIEW of the METAL SHOW for '56

(Continued from page 74)

The annual Metallographic Exhibit of the ASM will be on display during the entire week of the show, after which it will travel across the country on a tour of Metal Society Chapters and technical universities.

The annual meeting of the ASM will be held Wednesday morning, October 10, at the Hotel Statler, and it will be followed by the annual dinner on Thursday evening, October 11, at the same hotel. Dr. Charles S. Barrett, professor at the University of Chicago, Institute of Metals Study, will deliver the Campbell Memorial Lecture, following the annual meeting.

Awards will be presented to the seven metals field leaders during the Metal Society's Annual Banquet, and

at the A.S.M. Awards Luncheon on Tuesday, October 9 in Hotel Statler.

Edgar H. Dix, Jr., assistant director of research at the Aluminum Co. of America's Aluminum Research Laboratories at Pittsburgh, Pa., will be presented the Albert Sauveur Achievement Award for his outstanding work in aluminum alloys research. The award, established by the A.S.M. in 1934, is named for Dr. Albert Sauveur, late Harvard University professor and pioneer metallurgist.

William H. Eisenman, for more than 39 years national secretary of the A.S.M., was chosen by Society trustees for the A.S.M. Gold Medal. The trustees described Eisenman as a man who "advanced metallurgy from an art to a science" while helping build the society to its present membership of over 27,000 members in 100 chapters around the world.

Charles M. White, recently elevated from the presidency to the board chairmanship of Republic Steel Corp., will be given the A.S.M.'s Research Medal for his consistent sponsorship of metallurgical research and development.

Three scientists share the A.S.M.'s Henry Marion Howe Medal Award, named for the late Columbia University professor who led in establishing the science of metallography (micro-photography of metals). The three to be honored as Howe Medalists are Dr. Alexander R. Troiano, professor and head of the Department of Metallurgy at Case Institute of Technology, Cleveland; Dr. William J. Barnett, former Case research associate now with General Electric Co. at Evendale, Ohio; and Dr. Richard P. Frohberg, also a former Case research associate now a senior engineer with North American Aviation Corp., Downey, Calif.

The trio jointly authored a brilliant technical paper on "Delayed Failure and Hydrogen Embrittlement in Steel," published in *Transactions*, an A.S.M. technical journal reporting on Metal Congress papers.

Dr. Ernest P. Nippes, professor of metallurgy at Rensselaer Polytechnic Institute, Troy, New York, will be given the A.S.M.'s Teaching Award for his outstanding performance in the teaching of technical men.

Hardened and Ground Parts are our Specialty

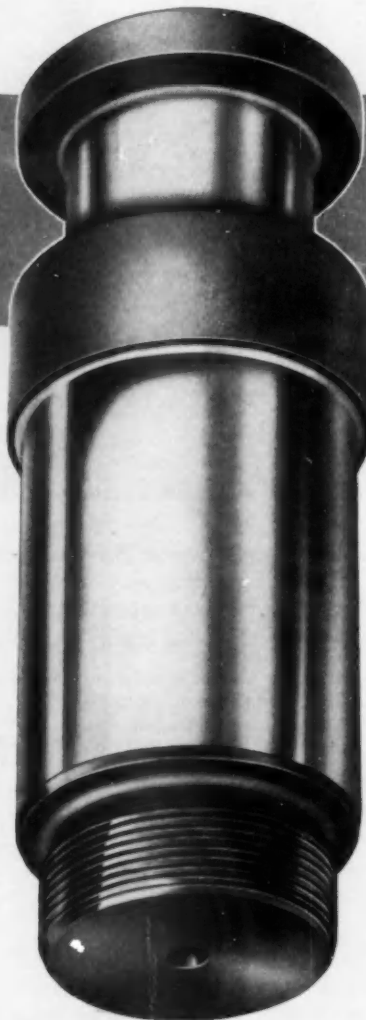
This king pin is truly king-size: 8" long and weighs about 12 lbs. We machined it out of No. 3140-2½" bar steel. After heat treating, bearing surface was given the specified fine finish-grind to 2½" dia., $\pm .000$ —.001.

Parts like this are our specialty—we've been making them exclusively for the automobile industry for more than 40 years. Each year has added to our knowledge and skill in precise machining, scientifically-controlled heat treating and micro-finish grinding. Let us show you what we can do with one of your tough jobs. Write or wire.

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... anything in the hardened and ground line, of any analysis steel, up to 4¼" diameter.



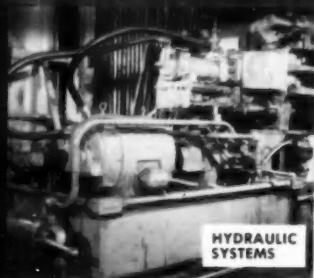
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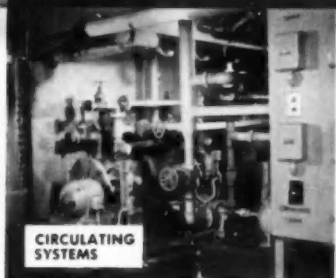
SYRACUSE, N. Y.

C. H. Ehlert, 3407 Clarendon Rd., Cleveland • N. F. Spring, 4716 Balfour Rd., Detroit • R. C. Sanderson, 2342 N. Cicero Ave., Chicago • Harry J. Windmiller, 1704 Carlton, Fort Worth • Lyle M. Johnson, 1355 Westwood Blvd., Los Angeles, Calif. • John B. Hunt, 5611 S. E. Yamhill St., Portland, Ore.

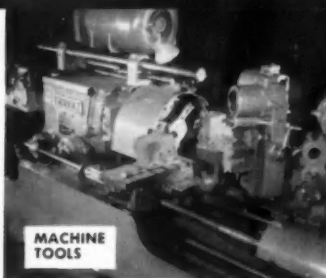
EXECUTIVES READ
AUTOMOTIVE INDUSTRIES



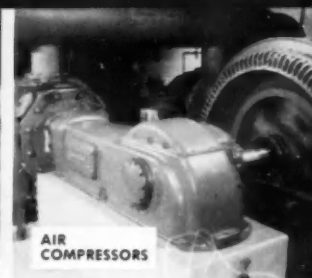
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SUN SOLNUS OILS IDEAL LUBRICANTS FOR 80% OF ALL APPLICATIONS

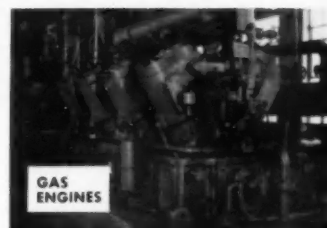
Moderately priced...low in carbon-forming tendencies, Sun Solnus® oils simplify your storage problems by doing with *one oil* many jobs that would otherwise require *several*. Their ability to protect metal parts against corrosion, their resistance to oxidation, and their moderate price all add up to "more lubrication per dollar."

For technical information, see your Sun representative, or write to SUN OIL COMPANY, Philadelphia 3, Pa., Dept. I-51.



INDUSTRIAL PRODUCTS DEPARTMENT
SUN OIL COMPANY
PHILADELPHIA 3, PA. © SUN OIL CO.

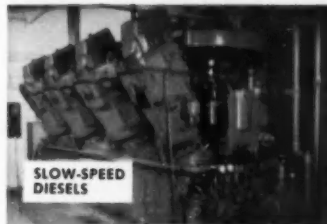
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GAS
ENGINES



GEAR
BOXES



SLOW-SPEED
DIESELS



Valve on left is from compressor run for 3,000 hours with well-known, high-grade oil. At right is same valve after a 3,000-hour run with Sun Solnus oil. Note difference in carbon deposits.

3000-HOUR TEST PROVES SUN SOLNUS OILS REDUCE CARBON BUILD-UP IN COMPRESSORS

Equipment: A three-stage Norwalk horizontal-type compressor. Operating pressure: from 1,000 to 1,500 psi.

Test: The compressor was cleaned thoroughly and filled with a well-known, high-grade oil. The equipment was run for 3,000 hours, then torn down for inspection and cleaning. Then Solnus® 300 was tested in the same way.

Results: Look at the two pictures. You can see for yourself how Solnus oil reduced dangerous carbon build-up.

All types of reciprocating air compressors that have been changed over to a Sun Solnus oil show similar results. A test in your compressor will show the same remarkable reduction of carbon deposits.

You can get a technical bulletin about Sun Solnus oils by asking your Sun representative, or write to SUN OIL COMPANY, Philadelphia 3, Pa., Dept. I-52.



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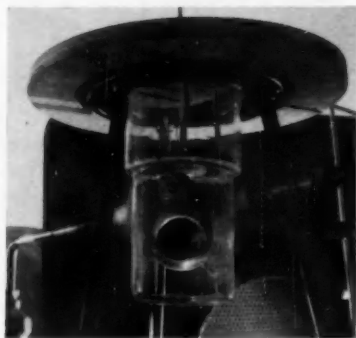
© SUN OIL CO.

IN CANADA: SUN OIL COMPANY LIMITED, TORONTO AND MONTREAL

AUTOMATION News Report

(Continued from page 71)

portant role in the new development, for which significant defense implications are predicted. Among the advantages pointed out by G.E. spokesmen are extensive weight reductions made possible by the elimination of bulky, power-consuming cooling equipment from missiles and aircraft. In addition, the new components have



A radio signal is picked up and amplified by the electronic circuit shown here operating literally "red hot." Blowtorches are being applied to the Pyrex glass jar in which the circuit is enclosed.

shown a high tolerance to nuclear radiation, making it possible to install them in atom-powered aircraft.

All of the devices demonstrated are laboratory models, G.E. spokesmen stated. Although they are completely workable, none of them are in production, at the present time, or are available for sale.

AUTOMATION EXPOSITION

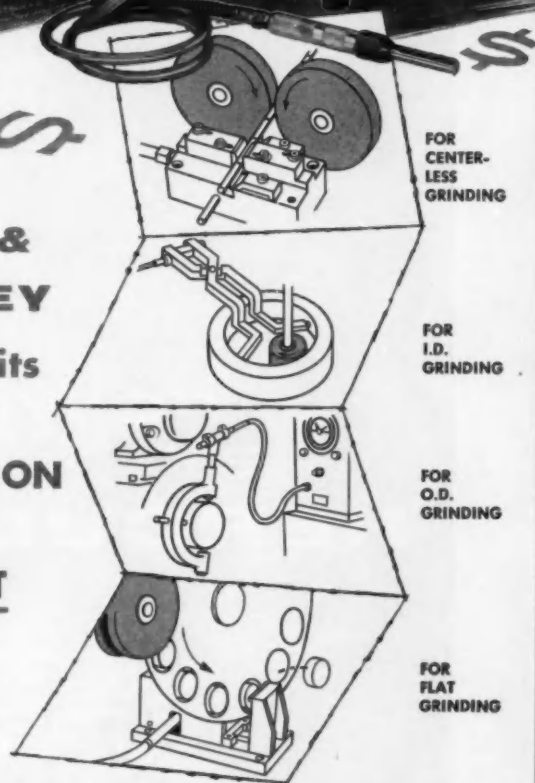
Almost 200 manufacturers will display their products at the Third International Automation Exposition, which will be held from November 26 to 30, at the New York Trade Show Building, 500 8th Avenue, New York City. Equipment on display will include practically everything necessary to automate any process in a plant or office — from automatic assembly, handling, and data processing equipment to subminiature relays and switches.

In addition to the exhibits, the show will feature 60 lecture-demonstration clinics on computers, process automation, machine automation, servomechanisms, and electronic components. The clinics are sponsored by the show management and are sched-

There's
"Jack"
in this
BOX!



PRATT &
WHITNEY
control units
provide
AUTOMATION
the EASY,
LOW-COST
way



Increased production . . . reduced reject losses . . . greater accuracy! These are the profitable advantages you get through Automatic In-Process Gaging. And now, *standard, on-the-shelf* Pratt & Whitney Control Units . . . plus a minimum of special gaging fixtures . . . can give you an in-process gaging installation exactly tailored to *your* needs *without* the long delays and heavy expenses involved in engineering and constructing special equipment.

GET FACTS AND FIGURES . . . Prove how P&W Automatic, In-Process Gaging can improve your profit picture . . . how easily it can be applied to your machines. Phone the P&W Branch Office near you and ask a Pratt & Whitney Direct-Factory Gage Specialist to analyze your needs and submit his recommendations.



PRATT & WHITNEY COMPANY
INCORPORATED

18 Charter Oak Boulevard, West Hartford 1, Connecticut
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MACHINE TOOLS • GAGES • CUTTING TOOLS

POWER BY HERCULES...!



"PAYLOADER" Tractor Shovels rely on . . . power by Hercules. These popular tractor-shovels require lightweight, high-speed, heavy-duty engines. That's why Hercules Gasoline and Diesel Engines were selected for many of the "PAYLOADER" models.

Hercules on-the-job engines are tailored to the specific power needs of all types of equipment in the following industries: transportation, agriculture, construction, mining, industrial, logging, oil field and marine.

For "top-notch" performance, insist on . . . power by Hercules in your equipment.

HERCULES MOTORS CORP. • CANTON, OHIO

uled each morning from 9 to 12:30. Other events: A two-day "Senior Officer Conference on Office Automation," sponsored by Fordham University School of Business to be held at the New Yorker Hotel; and a two-day conference on Human Engineering and Automation, sponsored by the Manhattan College School of Engineering.



Cost of developing a supersonic fighter is double the funds required for a jet fighter used in the Korean War.

Turbojet engines, averaging 8800 lb of thrust, accounted for 77 per cent of all engines delivered to the Air Force in 1955, compared with 67 per cent turbojet types in 1954.

Passengers carried by a scheduled helicopter service operator increased 300 per cent in 1955 over the previous year.

Installation of turboprop engines on a transport that uses conventional piston engines increased its power 63 per cent and decreased empty weight by 5000 lb.

Once 14 out of each 20 Americans had to work in the land to produce enough food for all. Now only three of each 20 are engaged in agriculture.

It costs oil companies half a billion dollars to improve the quality of gasoline by one octane number. Yet, the average octane rating of gasoline has risen from 74 to 84 in the past 26 years.

Fifty per cent of all marketed gas is used in the states where it is produced.

Of the record-breaking 127 billion lb of chemicals produced in the U. S. this year, one quarter, or 35 billion lb will be chemicals derived from petroleum.



Photo sequence shows impact cleat burying itself in the tread of a nylon cord tire. Nylon cord tires can take this punishment up to 300,000 times, while ordinary tires will stand only about one-fifth as many blows.

THERE'S EXTRA SAFETY IN NYLON CORD TIRES

Tires are among the components that can help make today's fine cars even safer. For our roads—whether superhighway or city street—are traveled to a point that tire failure of *any* kind is a potential danger.

- Nylon cord tires offer utmost safety, surest protection against tire trouble. Nylon tires have proved their superiority on military and commercial planes and on heavy-duty trucks. The people whose lives and livelihood depend on the ability of cars to perform at high speeds rely on nylon tires. Turnpike police, professional auto racers and high-speed test drivers are examples.

- Nylon cord tires reduce unsprung weight, and they readily absorb the added strains of power steering, braking, and higher horsepower.

- Nylon cord tires are among the components which contribute importantly to motor-car safety. They are the coming standard of the industry. As original equipment, they provide a valuable sales feature—extra safety.



BETTER THINGS FOR BETTER LIVING...THROUGH CHEMISTRY

*Du Pont produces the nylon fiber.
Tire manufacturers make nylon cord tires
—in tubeless or conventional types.*

FOUR PROCESSES THAT TURN IDEAS INTO REALITY

Rolbos

"STOP-ROLL" EMBOSING

Roller embossed dramatic dashboard panel...
"Stop-roll" process stops the design
at any desired place.
Any design may be reproduced.

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COINED WITH LUG—OF ALUMINUM

A new and better way
to make emblems, letters, etc.



Lug is cold forged from plate,
making lug and plate one integral unit.



Embos

DEEP DIMENSIONAL EMBOSING

Beautiful combination of
deep embossing and stamping.
All operations, including assembly
are done in our plants.



Etchrte

SPECIAL "SHARP-ETCH" PROCESS

Fine etching and lithography
are combined to make distinctive instrument dials,
name plates, body plates, etc.



We can create and produce for you exciting
style in Trim and Parts—at low cost—
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ETCHED PRODUCTS CORPORATION

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WORKING IN ALL METALS

WE DESIGN AND BUILD OUR OWN TOOLS AND DIES.

Canadian Plant Installs 200-Ton Skin Milling Machine

(Continued from page 70)

guided by the operator along the contours of the template. This stylus, under eight ounces of pressure, transmits its readings to an electronic center which sends out the pattern to the large traveling head of the machine. As the 70-ton head and gantry start to move, the tool begins to trace the same pattern on a solid billet of aluminum, ripping the chips out at high speed. During test runs a tool taking a cut 2¾ in. wide by 1¾ in. deep chewed through the metal at about 9 fpm. To keep the tool cool while running at these speeds a flood coolant system provides 75 gpm.

On a typical skin job the machine will start with a 3300-lb billet of aluminum and end up with a finished product weighing under 300 lb, having milled out 90 per cent of the weight in chips. To keep the machine from burying itself in chips, they are fed onto a conveyor belt, which in turn feeds them into mobile scrap bins.

The large slabs of aluminum are held in position on the work table by vacuum, and the tool can be tilted and swiveled to facilitate the cutting of tapered skins and converging ribs. There are 30 motors in various parts of the machine.

The mill is provided with several protection devices. If the vacuum holding the work drops below a certain minimum the tool stops cutting and retracts. The same thing happens if the tool begins to over-heat. To prevent any danger of a tool cutting too deep and into the harder metal of the work table, a two-inch slab of aluminum is permanently fitted over the whole table area and the work rests on this. First cutting job for the mill was to take a fine shaving off the whole of this aluminum slab to insure its accurate alignment with the traveling head.

The mill weighs 200 tons and rests on 150 cu yd of reinforced concrete which was laid in one integral pour. Base of the foundation is four feet thick.

AC Spark Plug Designing Missile Guidance System

AC Spark Plug Div. has been assigned another job under its development program with the Air Force. The company is now designing a guidance system for a new version of the Matador missile, a pilotless bomber made by the Martin Co. of Baltimore, Md., labelled the TM-61B, the missile can climb to altitudes of over 35,000 ft, at speeds exceeding 650 mph. AC also is designing a guidance system for the Air Force's intercontinental ballistic missile under a contract it received several months ago.

*advanced design in
turbochargers
means...*

air-cooling!



**AiResearch
turbochargers
possess this
all-important
characteristic**

There's little quarrel in the diesel industry about the air-cooling principle being highly-desirable in a turbocharger. It eliminates the need for extra plumbing on installation, puts no additional burden on an engine's cooling system and makes for a lighter, smaller unit in relation to output.

AiResearch turbochargers now available have been designed on this principle — which promises to be universal in the future. In addition,

our units increase power up to 100% depending on design and application of your engine, cut fuel costs, reduce noise and decrease or eliminate smoking. The removable rotating assembly

makes them easier to maintain than other turbochargers.

We invite your inquiry on how you can improve the performance of your diesels by the application of our turbochargers.

BASIC SPECIFICATIONS FOR AIRESEARCH TURBOCHARGERS

MODEL	T-10	T-14	T-15	T-30-2	T-30-6
Diameter — in. nom.	9	11.5	15.25	15.25	16
Length — in.	9	14.12	16.75	17.25	21.75
Weight — lb.	40	95	125	135	195
Output — lb./min.	25-40	35-65	35-65	70-95	115-175
(Standard Conditions)					

THE GARRETT CORPORATION

AiResearch Industrial Division

9225 South Aviation Blvd., Los Angeles 45, California

DESIGNERS AND MANUFACTURERS OF TURBOCHARGERS AND SPECIALIZED INDUSTRIAL PRODUCTS

AUTOMOTIVE INDUSTRIES, October 1, 1956

121



YOU'LL DO BETTER WITH UNITCASTINGS!

We make no *special* claims to produce miracles with cast steel. Like competitive foundries, problems are similar . . . equipment may differ slightly . . . it's the *end performance* of the casting that counts!

A little *extra* surveillance in process pays off quality-wise. Customers receive better, cleaner castings . . . meeting accepted specifications . . . and end up with a lower *finishing* cost. Less scrap . . . less re-work . . . and less lost production time amounts to more than incidentals!

Standard carbon and low alloy steel castings, up to 150,000 psi tensile . . . whatever your requirements, specify Unitcastings!

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Unitcast



QUALITY
STEEL
CASTINGS

FUEL FACTORS

(Continued from page 58)

the intake manifold of the average V-8 engine operating at 2000 rpm. It is more likely, therefore, that intake deposits which are not of the pre-formed type are formed primarily in the liquid film that travels along the interior surfaces of the manifold. Under these conditions the fuel is exposed to large quantities of air and elevated temperatures for periods of considerably greater duration than for the components in the vapor stream.

To continue further along this line of reasoning, it is known that oxidation reactions occur during the compression stroke of internal combustion engines. However, as may be observed in Fig. 9, none of the commercially available gasoline antioxidants at concentrations normally employed measurably affect piston varnish formation. These data are averages of CRC, FL-2 piston scores obtained on the six gasolines previously described in connection with the study of stability and deposit-forming properties of present-day gasolines. It must be concluded, therefore, that either these reactions are not inhibited by ordinary antioxidants or the oxidation of the gaseous portion of the fuel does not seriously affect piston cleanliness. The fact that low engine operating temperatures accentuate piston varnish formation provides further evidence that liquid phase deterioration is perhaps the most critical form of fuel degradation in this area of the engine as well as in the induction system.

If this premise is correct, it would be anticipated that a reduction in the quantity of liquid present in the intake manifold would reduce deposit formation. Reduction of the liquid film is accomplished in modern engines by the application of heat to the intake gases through hot spots or by passage of exhaust gases around the carburetor. The resulting increase in temperature would be expected to accelerate deterioration of the fuel in the manifold. The latter has been found to be insignificant, however, in comparison with the improvement resulting from the improved vaporization. The effect of improving vaporization by elevating the intake mixture temperature is illustrated in Figs. 10 and 11. In Fig. 10 intake valve deposits are expressed (Turn to page 128, please)

Q: *How to heat vehicles?*

Q: Chilly day at Thule (-50°F.) . . . how to start fire-crash truck within seconds, provide 90,000 Btu/hr. in small space?

A: Janitrol liquid heater (tested to -65°F.) keeps engine ready to go, provides cab and cargo heating too!



Q: How to find money to build heated storage buildings for Diesel bus fleet?

A: No need to find it, park the fleet outside—Janitrol liquid heaters keep engines, and bus interiors warm, ready to go at a fraction of cost of new building.

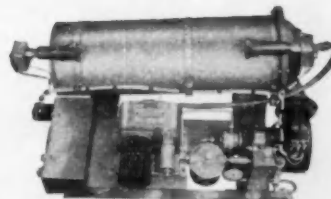


A

A: Call on Janitrol. If there's a need for heat for the job anywhere, chances are Janitrol can supply it, or build it from service-proved components.

Ever since designing and manufacturing the first successful heaters for aircraft 14 years ago, Janitrol has built thousands of heaters for aircraft and ground vehicles.

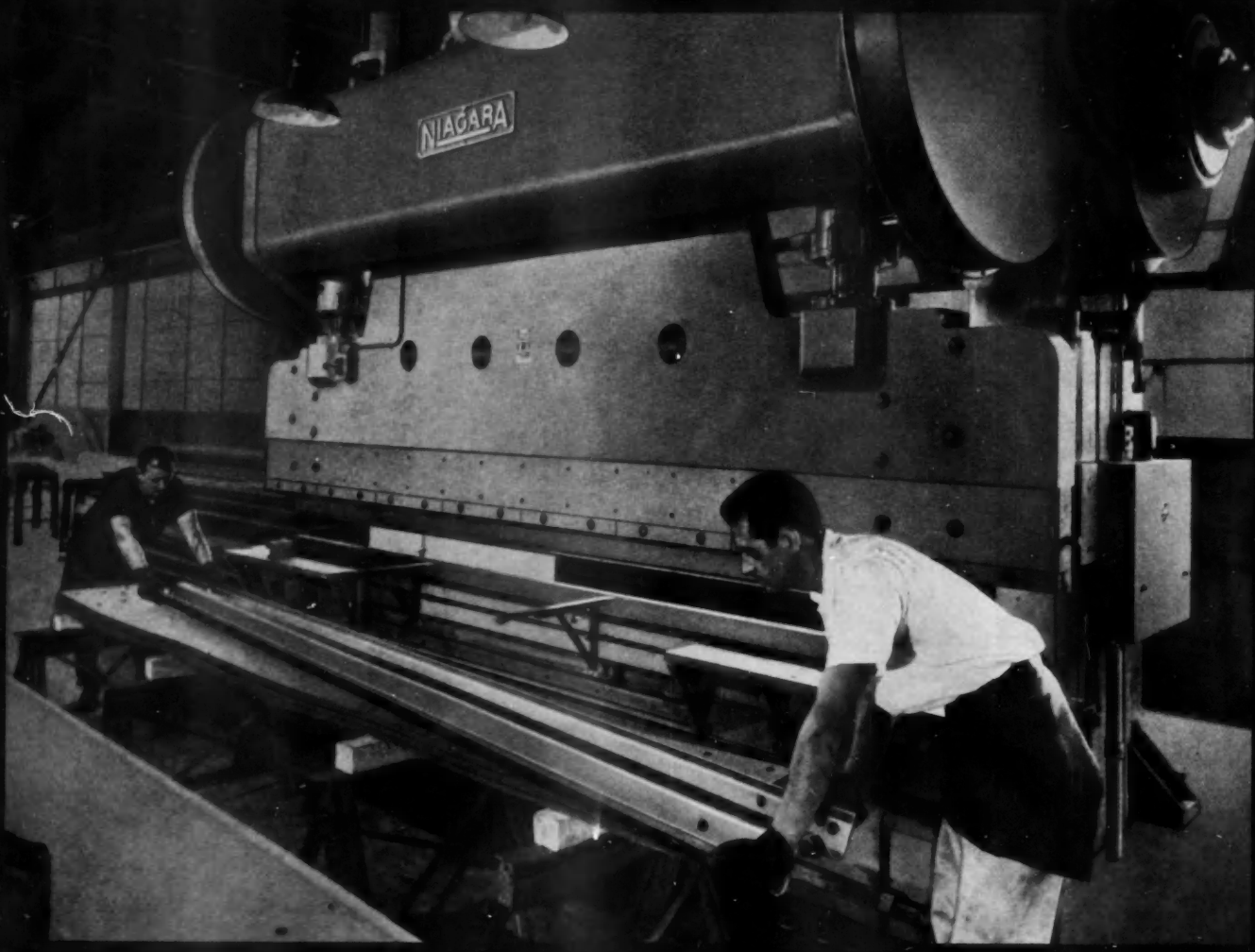
Today the name Janitrol stands for leadership in heating equipment and combustion engineering. Your Janitrol representative is always at your service.



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DISTRICT ENGINEERING OFFICES: WASHINGTON, D.C., PHILADELPHIA, COLUMBUS, FT. WORTH, HOLLYWOOD



"we go back to



(Above) Forming highway guard rails from 12 gage steel on Niagara 520 Ton Press Brake.

(Right) Piercing rails with same machine.

(Far Right) Forming chair seat frames for office furniture from 20 gage steel on Niagara 150 Ton Press Brake.

Niagara for Press Brakes"

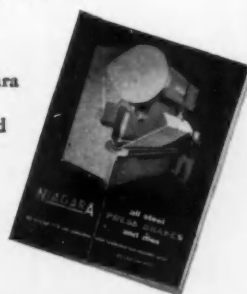
"The personnel of our organization has been acquainted with Niagara equipment for years. Niagara will stand behind *any* equipment furnished. Many millions of operations in the past 5 years on their presses and press brakes... equipment satisfactory from both the operational and safety standpoint. Our intention is to use the Niagara line entirely."

There in the words of one customer (a large Ohio metal fabricator whose press brake operations are illustrated), you have the sentiments of hundreds. Once experienced with *any* of the other metalworking machines which Niagara makes... presses, shears, bending rolls and dozens more... one just naturally thinks first of Niagara whenever the subject of press brakes comes up.

REASONS ARE MANIFOLD: (1) Extreme helpfulness of Niagara's engineers in selecting the machine and accessories that will do the job best (no other manufacturer can offer so complete and large a line of sheet and plate metalworking equipment). (2) Unrivalled reputation and experience in the field, dating back 77 years, that assure unquestioned reliability. (3) World-wide recognition for design leadership, combining rock-bottom operating economy and top-notch performance in *every* product it makes (take a moment to run down this partial list of imposing press brake features):

- *Double end twin drive with double reduction gearing for smooth, uniform application of power at both ends of ram.*
- *Rugged, all-steel frames with box type crowns of unequalled strength and rigidity.*
- *Extra heavy, rigid bed and ram for maximum support of dies.*
- *Gearing totally enclosed in sealed oil baths for thorough, clean lubrication.*
- *Longer lasting, laminated, nonmetallic ways.*
- *Powerful, smooth-acting, multiple disc clutch and brake.*
- *Gibs maintain accurate, endwise alignment of ram.*

Standardized in a complete line, ranging from 50 through 775-ton capacities, Niagara Press Brakes are built to produce a tremendous variety of work uniformly and accurately. Post yourself now on all the details by requesting Bulletin 89 D and, as soon as you can, avail yourself of some really worthwhile suggestions from a Niagara representative. Write.



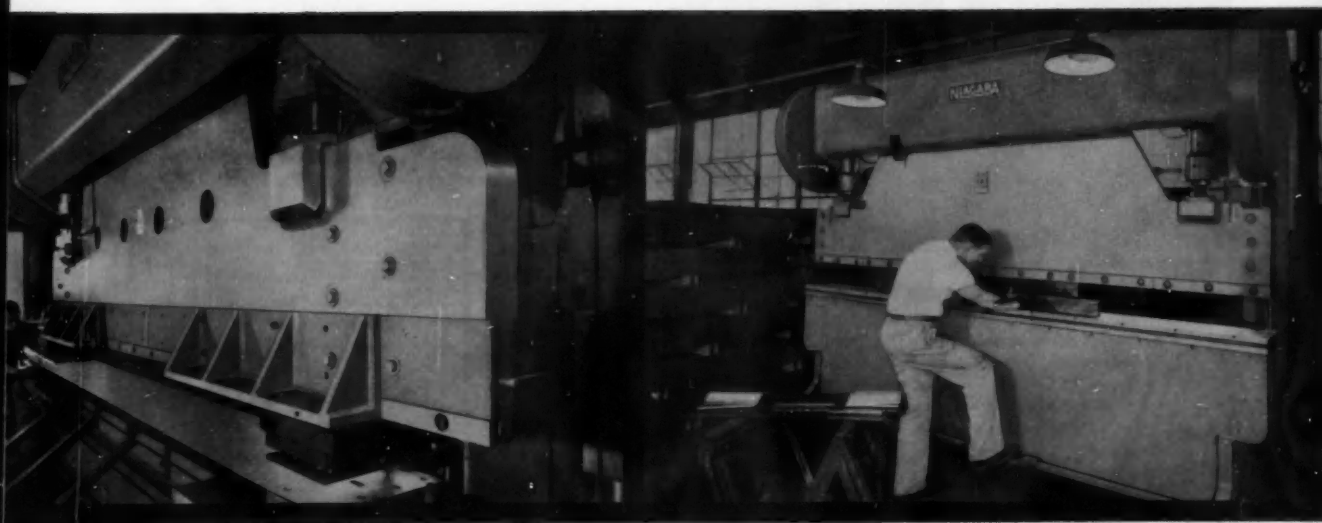
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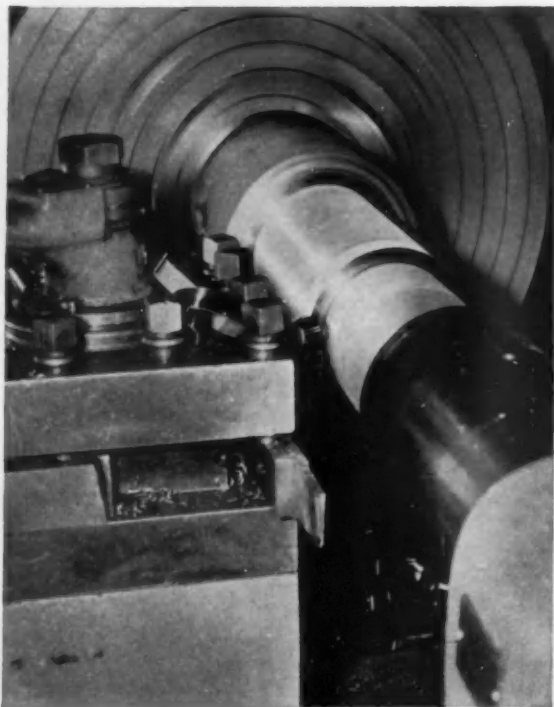


NIAGARA PRESS BRAKES

More production for your tooling dollar is the reason...

WHY IT PAYS TO SPEND FOR CARBOLOY EXTRA—

If you rely on "Equivalent Grade" Charts to save a few tooling pennies, these facts on carbide costs may save you thousands of production dollars



TESTS ON STAINLESS STEEL VANED ROLLS by a New Hampshire pulp and paper-processing equipment manufacturer demonstrate how the "Equivalent Grade" Charts hide tremendous differences in carbides' production abilities. With Grade "X," production per tool was limited to two pieces per grind. Machine speed had to be held down to protect the carbide.

Switching to Grade 370 brought the manufacturer 8 to 9 pieces per grind. Machine speeds were doubled; 14 hours a day in labor were saved. Result: savings of more than \$100 a week, in addition to lower downtime, grinding, and inventory costs.

SO-CALLED "Equivalent Grade" Charts hide the fact that no two carbide grades will produce the same results. Because they classify carbides by broad areas of application, the Charts ignore important differences in production ability.

Thus, they mislead buyers into believing they can safely purchase the cheapest grade listed for a job.

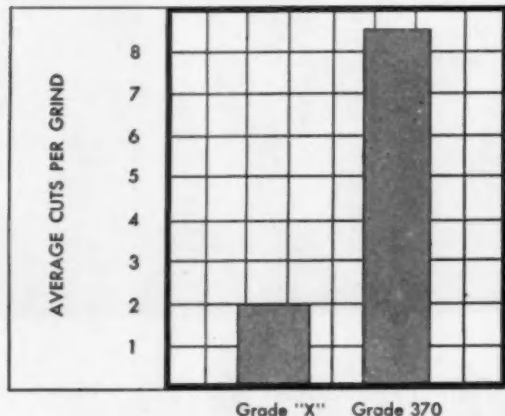
But actual tool-comparison tests have proved conclusively that the production abilities of carbides do vary tremendously. Moreover . . . these tests show that the pennies saved by buying on low initial cost often lead to thousands of wasted dollars . . . in lost production, lower machine efficiency, non-productive man-hours.

The case history at left is one of hundreds demonstrating why cost per finished piece—not initial cost—is the only reliable guide to buying carbides.

Results of an actual comparison test

According to the "Equivalent Grade" Charts, any one of several carbide grades could handle the job of machining these rolls. The manufacturer tried Grade "X" first—because it cost 10% less, initially, than Carboloy® Extra-Performance Grade 370.

Grade "X," however, machined only two rolls per day. Grade 370 increased production to 8 or 9 pieces per day (Graph No. 1).



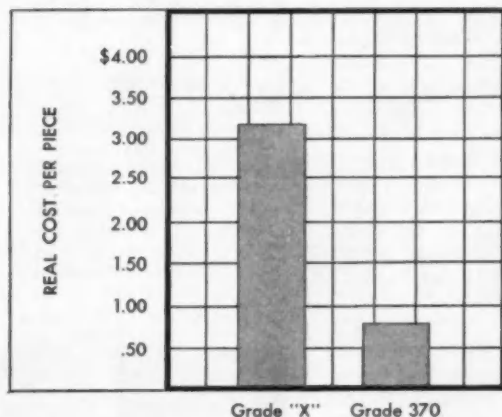
Graph No. 1—Production Ability Comparisons

*CARBOLOY IS A TRADEMARK OF GENERAL ELECTRIC COMPANY

A FEW CENTS MORE PERFORMANCE CARBIDES

When the *real* cost of the tools was calculated, the manufacturer found the initial saving with Grade "X" was actually *making* him *lose* more than \$100 a week. Here's why:

The real cost of Grade "X" was \$3.18 per piece machined (2 pieces from a \$6.37 tool). The real cost of Grade 370 is just \$.82 (average of 8½ pieces from a \$7.01 tool). On the weekly production of 42-43 rolls, the saving totals \$100.30!



Graph No. 2—Real Cost Comparisons

Yet even this eye-opening figure does not tell the whole story. The Grade 370 tool operated at twice the speed of Grade "X." It helped save the manufacturer 14 hours a day in labor. It provided twice the tool life. It eliminated a special finishing tool.

When these facts were translated into dollars and cents, the manufacturer found that downtime costs were reduced, because the tool remained on the job longer. Grinding costs were reduced, because the tool required less maintenance. Inventory costs were reduced, because a few tools did the work of many.

When added up, these amounted to a considerable saving—yet nothing in the "Equivalent Grade"

Charts could have forecast it. These are savings which buying on the basis of initial cost always obscures. These are savings which more than justify spending a few cents more for carbides with extra production ability.

Carboloy Extra-Performance Carbides available for all steel-cutting jobs

Heavy-Duty Grade 370, used in the test above, is one of three Carboloy Extra-Performance Carbides. Together with Medium-Duty Grade 350 and Finishing Grade 330, these grades cover the entire steel-cutting range from roughing to finishing.

Extra-Performance Grades 330, 350, and 370 cost more, initially, because they are made by a unique and more costly process. But their performance so far exceeds conventional carbides that there are actually no "equivalent" grades for any of them. They cannot be fitted into the arbitrarily selected cubbyholes on the "Equivalent Grade" Charts now in common use.

These Extra-Performance Grades easily expose the fallacy of the "Equivalent Grade" Charts, because they are so superior to other steel-cutting grades. But even when attempting to classify conventional grades, the Charts exhibit the same fatal flaw.

Because there is no way of knowing in advance how any grade will perform on the job, we make this suggestion: Always run your own comparison tests *before* you specify a grade. When the results are in, you will find that one grade will bring your plant significant savings in tool costs, machining and labor expense.

We think you will find *that grade* will be one of the Carboloy Extra-Performance Carbides. But whatever it is, specify it *by name*. Do not settle for an "equivalent" grade.

If you would like a more detailed discussion of the whole problem of Initial Costs vs. Real Costs, and the fallacies of the so-called "Equivalent Grade" Charts, write today for a sales engineer to call on you. Send your request to: *Metallurgical Products Department of General Electric Company, 11151 E. 8 Mile Ave., Detroit 32, Michigan.*

CARBOLOY

CEMENTED CARBIDES

AT THE METAL SHOW: "New Worlds in Metalcutting" with Carboloy Cemented Oxide and Carboloy carbide grades 330, 350, and 370. Booth No. 2124.



**DON'T GIVE ME
THAT!**

YOU CAN'T BEAT GARRETT SERVICE

I'm not a wise guy, but I do know about the service these Garrett plants give you. Seems hard to believe. Those fellows bend over backwards to help you out in an emergency. And their regular service means you always get deliveries when promised ... sometimes before.

Of course, when it comes to quality they are tops on lock washers, flat washers, spring washers, hose clamps, stampings and assemblies. They have three plants equipped with the most modern high-speed automatic machinery to turn out billions of parts to exact specification ... complete heat treating, plating and finishing facilities. If you don't believe me, next time send your order into Garrett. You'll see why their customers say **YOU CAN'T BEAT GARRETT.**

**LOCK WASHERS
FLAT WASHERS
HOSE CLAMPS
STAMPINGS**

Manufactured by
GEORGE K. GARRETT CO., Inc.
Philadelphia 34, Pa.



FUEL FACTORS

(Continued from page 122)

as a function of intake mixture temperature. These data were developed by the Mellon Institute using a two-cylinder engine (Ref. 8). The low deposit values at the low temperatures are probably due to a washing action of the large quantities of liquid fuel. These conditions normally cannot be tolerated from the standpoint of inefficient combustion and piston varnish formation. As the degree of vaporization is increased, the washing action is decreased and valve deposits are formed more readily; however, as the mixture becomes essentially dry, deposit formation is reduced to a minimum.

A similar trend is indicated in Fig. 11. The data shown represent deposits formed in the Laboratory Baffled Manifold Test at various intake manifold surface temperatures. These results, obtained on a single gasoline, demonstrate the same increase in deposits at intermediate temperatures followed by a rapid decrease in deposits as the temperature is further increased. It is apparent that any increase in deterioration of the gasoline in the vapor phase which resulted from the increased temperature was insignificant in comparison with the effect of eliminating the liquid film on the inner surfaces of the manifold.

The foregoing article is from a paper presented by the author at the Symposium on Vapor Phase Oxidation of Gasoline sponsored by Technical Committee A, Section VII of ASTM D-2, at Los Angeles, Sept. 19, 1956.

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A new caster series from Albion Industries. Designed for any application requiring light weight, high capacity, and low overall height. Recommended for furniture, food containers, dollies, portable cabinets, bins and baskets. Cadmium plated for positive rust resistance. 3" diameter wheel with choice of treads. Capacities to 300 lbs.



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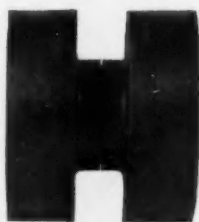
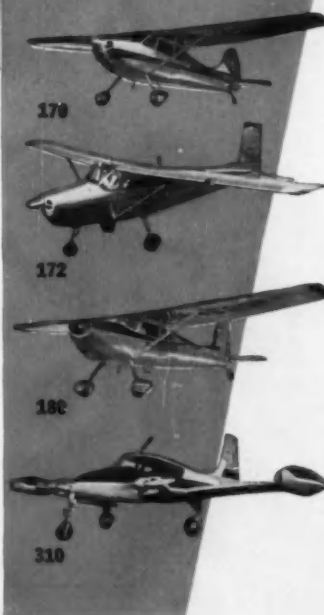
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features "hush-flight" engine suspension by **LORD**

■ The "hush-flight" of the Cessna 182 features exceptional quiet, flight smoothness, safety, and comfort, with engine and propeller noise and vibration greatly reduced through LORD Dynafocal® mountings. This flexible engine suspension system supports all engine weight and minimizes airframe vibration and fatigue.

The LORD Dynafocal application in this executive craft is another example of LORD's ability to solve vibration problems for the aircraft industry. For information, call your nearest LORD Field Engineer or the Home Office, Erie, Pennsylvania.

Cessna's complete air fleet is equipped with Lord mountings:



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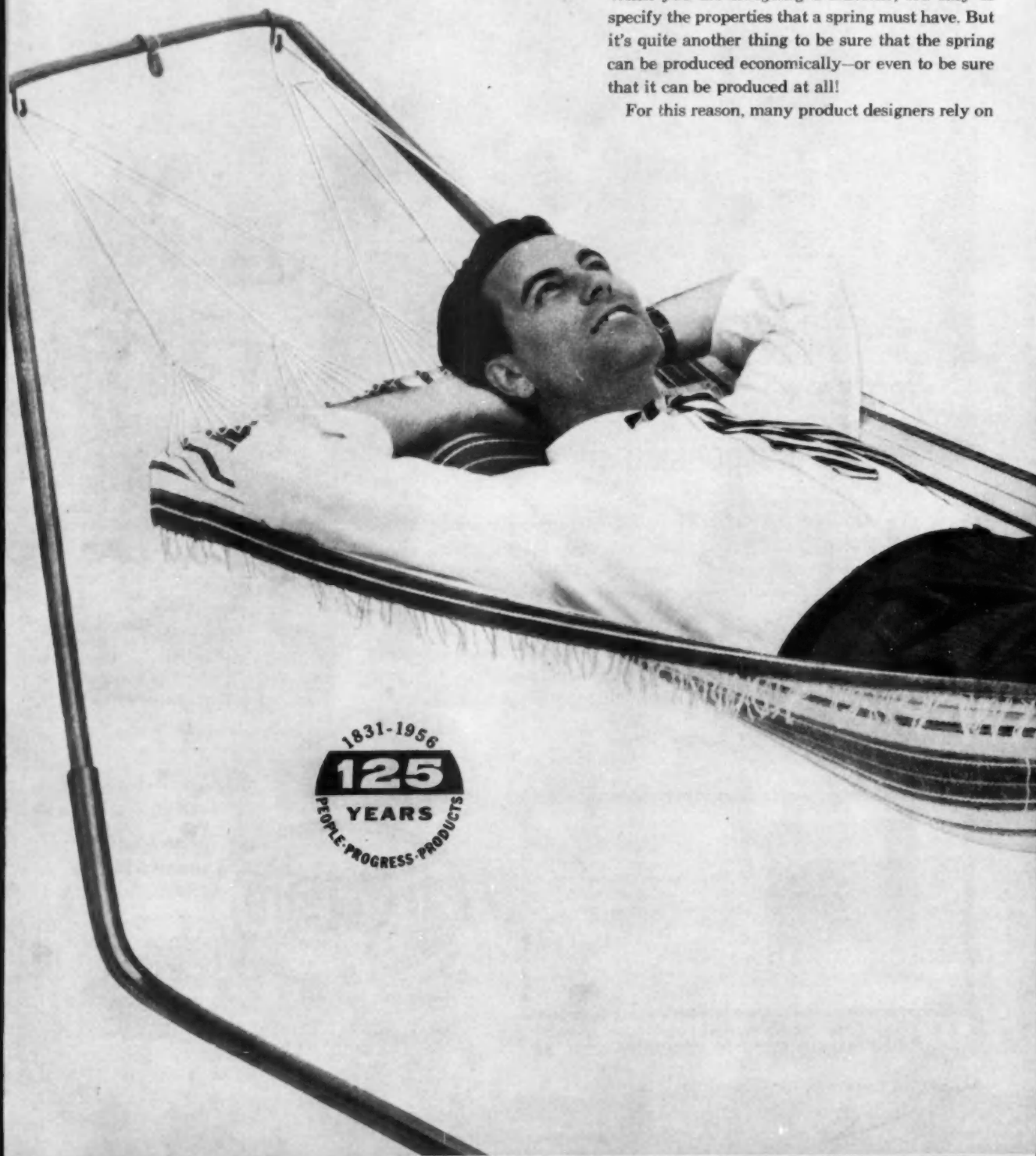
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When you are designing a machine, it's easy to specify the properties that a spring must have. But it's quite another thing to be sure that the spring can be produced economically—or even to be sure that it can be produced at all!

For this reason, many product designers rely on



when you have a spring problem Steel & Wire worry *for* you

specialists to help with spring design; and, believe it or not, even in these times of inflation, the specialists are free.

We refer, of course, to the spring engineers at American Steel & Wire. When you come down to the last phase of a new design, call in your Amer-

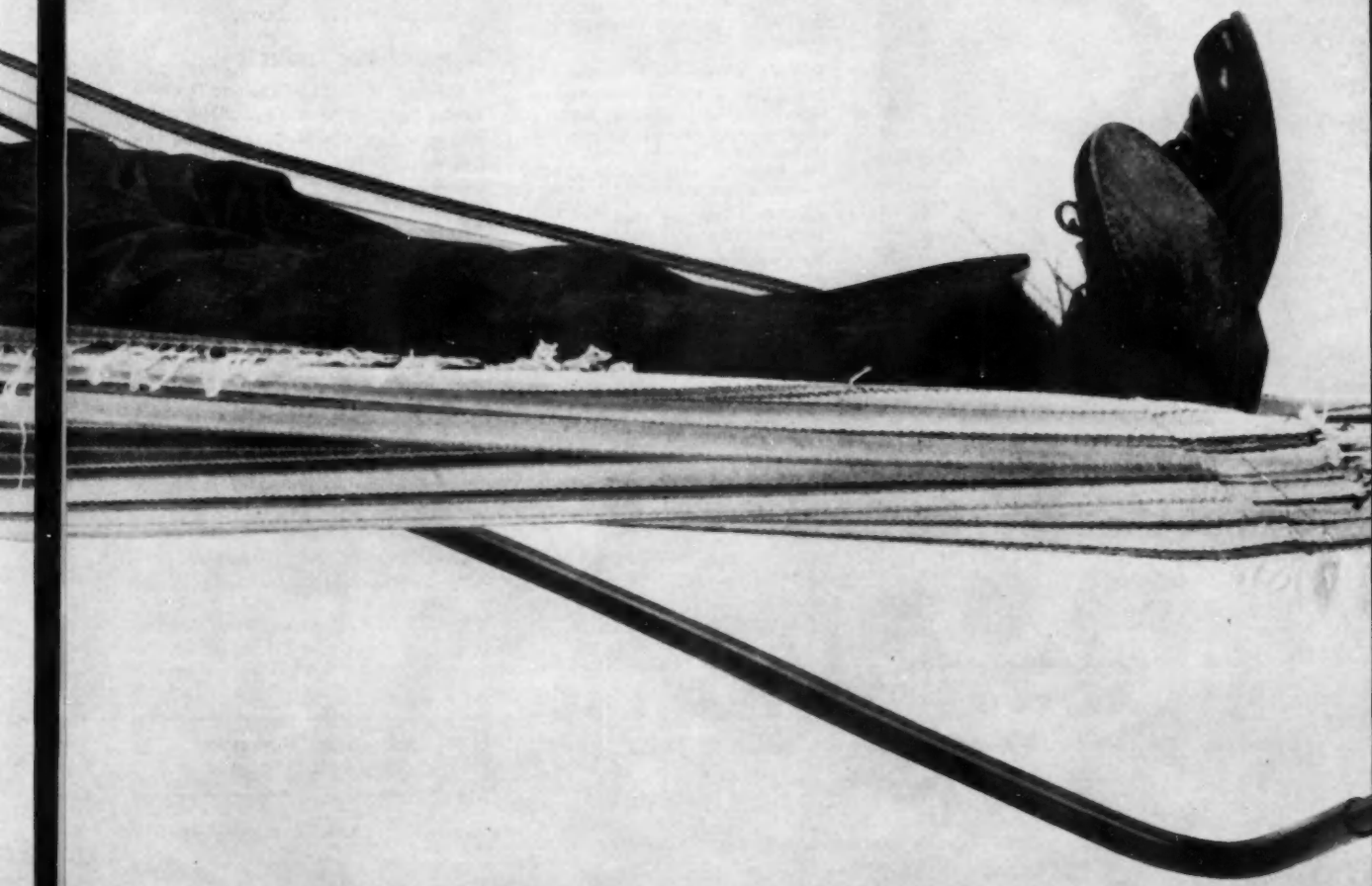
ican Steel & Wire representative. Perhaps a small specification change here, and a little design change there, will give you a *better* spring for the job, capable of mass production in high-speed machines with the obvious advantage of lower costs.

Just call your AS&W salesman.

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UNITED STATES STEEL EXPORT COMPANY, NEW YORK

USS AMERICAN *QUALITY* SPRINGS

UNITED STATES STEEL



The Shuttle Piston Fuel Injection System

(Continued from page 52)

maximum displacement of the shuttle piston between the two stops—consequently, the maximum quantity of fuel per injection. During part throttle operation, the manifold pressure is decreased and the differential pressure across the air piston displaces it to a new position. In like manner, the shuttle piston in the rotating sleeve is displaced inward by

a constant ratio to the movement of the air piston. As a result, the shuttle piston displacement is reduced by the proportion established by the engine requirements as sensed through the manifold pressure.

The above description applies to the original experimental units. At this time there are other refined versions of the shuttle piston fuel injection

system which employ cold starting mechanisms, new fuel nozzles, fuel enrichment devices and other such similar refinements.

Fuel injection units employing this shuttle piston principle have been installed on various engines and on experimental automobiles. Through the tests to which these units have been subjected, they are said to have proved that they give many high performance miles of reliable and satisfactory service.

News of the MACHINERY INDUSTRIES

(Continued from page 87)

chase of dies, jigs, fixtures, gages, plastic mold and special machines include those in the automotive and aircraft industries. Joseph N. Huser, president NTIMA, tells us that these same industries have been the steadiest buyers of special tooling throughout 1956. Most of the tool shops are working 50 hours a week or more to fill orders. One of the problems today is the short delivery demanded by industry. Naturally, a lot of this stems from new models being introduced by the automobile industry.

Around the Industry

Cincinnati Milling Machine Co. now has a backlog of \$113 million. The company has increased its prices from five to 10 per cent, effective last month.

E. W. Bliss Co. has acquired from American Flexible Coupling Div. of Zurn Industries, Inc., exclusive rights to the manufacture and sale of the fully crowned tooth gear type coupling for rolling mill equipment and other types of machines.

Jones & Lamson Machine Co. has bought the physical inventory, work-in-process, trade names, and designs of the Modern Tool Works, Rochester, N. Y. J&L plans to integrate the new line with its existing tools in the Thread Tool Div.

Wheelabrator Corp. is using Cone-Drive double enveloping worm gear speed reducers in its new Liquamatte rubber-tire-mold cleaning machines. The Cone-Drive unit was selected because of space limitations under the work table.

**AUTOMOTIVE INDUSTRIES
KEEPS YOU INFORMED**

use a **HYDROSCALE** ON YOUR CRANE HOOK!

weigh the
modern way!
cut your costs!



SAVE
FLOOR
SPACE!

SAVE MONEY!
SAVE TIME!

ALL WEIGHING IS DONE ON YOUR CRANE HOOK

You merely hang the HYDROSCALE on the crane hook, or hoist, and leave it there. Then, whenever you lift a load, you'll automatically weigh it, as you lift it. No extra equipment or plant facilities are required.

OUTMODES COSTLY CENTRAL WEIGHING STATION

By eliminating the central weighing station, you realize substantial savings in time, floor space and money. And, you provide for automatic weighing at any step in your crane operations, at a fraction of the former cost.

TYPICAL WEIGHING APPLICATIONS

Just a few of the many applications include—loading, unloading, batching, check weighing, foundry charging, production control, process control, checking inventory, and, protecting your equipment from overloading.

COMPLETE LINE OF 110 MODELS NOW AVAILABLE

There's a model to meet most any industrial weighing requirement, and to suit every crane application. Our largest model has a capacity of 200,000 pounds, while our smallest model has a capacity of 500 pounds. They're engineered and built for long service-life, and can be used on any standard crane or hoist.

HYDROSCALES guaranteed for one year

They are guaranteed to be free of defects in workmanship and materials, and to be accurate to 1/2 of 1% of the maximum dial capacity—for 1 year.

Write for descriptive literature explaining model features.

HYDROWAY SCALES, INC.

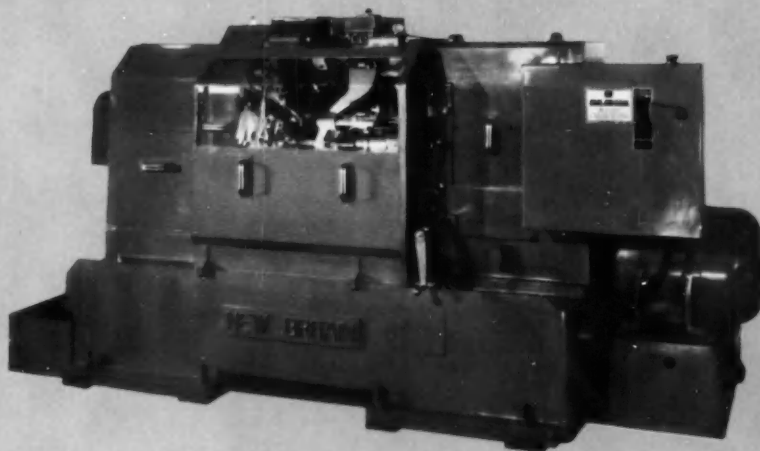
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"The world's largest producer of crane scales"

WHEREVER YOU TURN
on multi-spindle bar machines
NEW BRITAIN HAS THE MACHINE FOR YOU



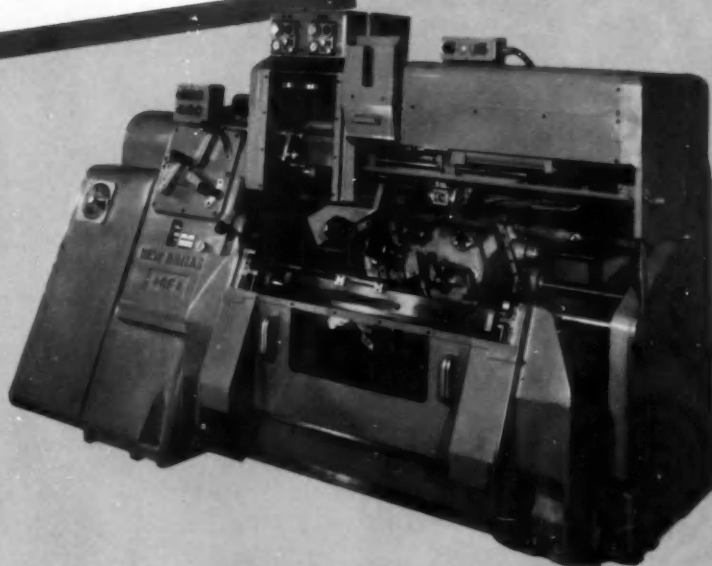
The new Model 62 New Britain bar machine has an independent radial cross slide in every position — opening new possibilities for effective tooling. New Britain "accuracy features" include spindle carrier lifting to eliminate wear during index, plus rigid locking of the carrier during the cutting cycle. Magazine loading available if desired.



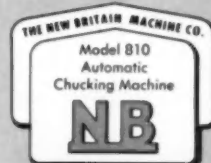
WHEREVER YOU TURN
long or short runs
NEW BRITAIN HAS THE MACHINE FOR YOU



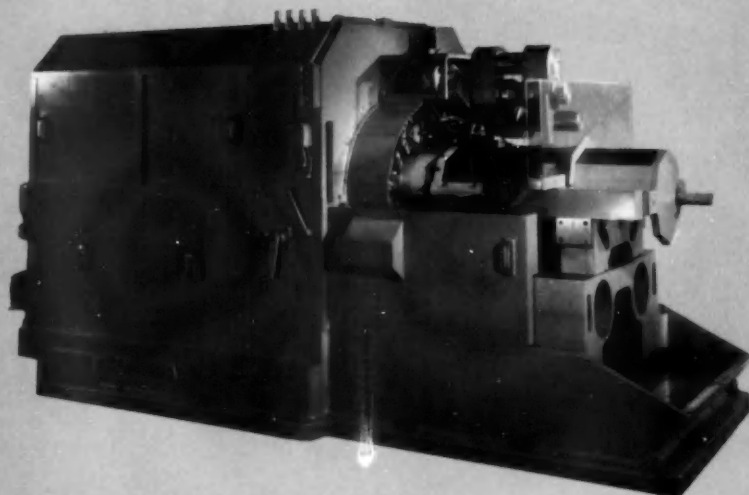
The original New Britain +GF+ copying lathe has grown into an extensive line, to meet the demand for the wide variety of applications for its better copy-turning principle. Regardless of length of run or the variety of pieces you make, you can use the New Britain +GF+ profitably. Basic advantages are: fast setup, inexpensive tooling, elimination of the chip problem, minimum operator fatigue, and dimensional accuracy with good surface finish to reduce grinding allowances. Optional features include automatic re-cycling, automatic loading and ejecting.



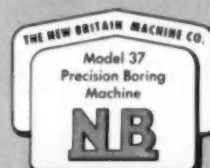
WHEREVER YOU TURN
castings, forgings or pressed metal pieces
NEW BRITAIN HAS THE MACHINE FOR YOU



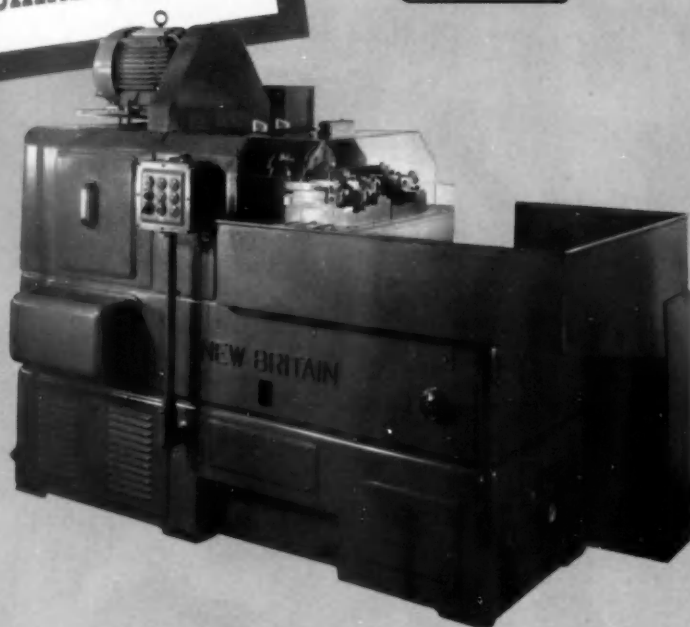
Versatility, accessibility, quick setup and sustained high production of precision parts are what you look for in an automatic chucker. New Britains are famous for these features all over the world. Perhaps you are also thinking of the possible savings which automatic loading, unloading and automatic gauging could effect. If so, you will want to learn about the imaginative use of automated production which New Britain engineers are applying to chucker work these days. You can now handle bigger pieces than ever on New Britains too — up to fifteen inches in diameter.



WHEREVER YOU TURN
or bore precision contour work
NEW BRITAIN HAS THE MACHINE FOR YOU



New Britain precision straight and contour boring machines provide a new approach to machining parts that would be problem pieces on any other type of equipment. These simple, fast, accurate machines require minimum attention and utilize inexpensive single point tools. They make the most profitable use of automatic loading, gauging and tool adjustment where these features fit the job requirements. The New Britain Machine Company, New Britain-Gridley Machine Division, New Britain, Connecticut.



SELF TAPPING SELF LOCKING

PHEOLL

SCHWEPPE STUDS

Patents Pending

CUT COSTS

- 1 ELIMINATE TAPPING
- 2 HOLD TIGHTER
- 3 CAN BE 'AUTOMATED'



WHEREVER a stud is specified, you can profitably cut production time and cost with self-tapping, self-locking Schweppe Studs. They also can replace bolts to advantage on many applications.

WHAT ARE SCHWEPPE STUDS?

They are double-ended studs made with dual thread-cutting slots at the lower end. Final threads on this end develop a positive frictional interference locking action on entering the hole.

HOW ARE THEY DRIVEN?

Schweppe Studs can be driven in an inexpensive drilled hole with any power stud driver. In one simple, continuous operation, they cut their own thread, drive, lock and seal.

WHAT ARE THEIR ADVANTAGES?

The self-tapping feature eliminates tapping time and thread inspection, tap wear and replacement, tap breakage and salvage time. The self-locking action of Schweppe Studs prevents loosening or backing out, even under extreme conditions.

WHAT ABOUT AUTOMATION?

Since Schweppe Studs may be located accurately from the slotted end, they can be "hopperized" for automatic feeding and driving.

• To fit many applications, Pheoll Schweppe Studs can be furnished in a broad range of metals, finishes, sizes and thread styles. Learn how you can profit... find out about the many advantages...

Write for free Bulletin 1056

PHEOLL
MANUFACTURING COMPANY
SCREWS • BOLTS • NUTS
5704 Roosevelt Road, Chicago 50, Ill.



Boom business right through March, 1957, is the official outlook in Government circles notwithstanding the Federal Reserve Board's recent actions to discourage business concerns and consumers from spending recklessly. Period of inflationary danger, as the Board sees it, will run from October through next March.

Statistics to be derived from a new Federal census of transportation will help industrial companies calculate probable costs of bringing in raw materials and distributing finished products. A five-part survey of transportation information for the year 1958 is under consideration by Commerce Dept.

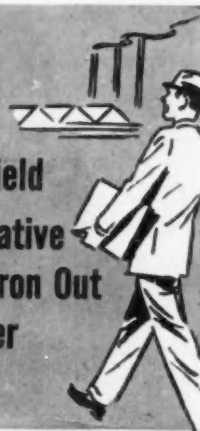
Businessmen have scheduled large increases in expenditures for new plant and equipment in the last two quarters of this year, according to Commerce Dept. and Securities and Exchange Commission. Expenditures anticipated in the third quarter are at a seasonally adjusted annual rate of \$36.3 billion, while fourth quarter outlays are expected to rise to a \$38 billion rate.

Excise taxes collected by the Federal Government in this fiscal year, ending next June 30, may be close to an all-time record because of the extra push given by highway use taxes. The intake this time may climb to around \$10.8 billion.

Cash dividend payments by corporations issuing public reports amounted to \$732 million in July, as compared with \$669 million in July 1955, Dept. of Commerce reports. Dividend payments reported for the first seven months of 1956, at \$6.1 billion, were up 15 per cent from the same period of last year.

Let an
O-M Field
Representative

Help You Iron Out
Fluid Power
Problems



The best way to solve your cylinder problems is to discuss the problems with your O-M Field Representative in your own plant or office.

Whether you are using air or hydraulic power, your O-M Field Representative can be of valuable assistance to you. His broad experience with cylinder applications and installations qualify him to recommend the air or hydraulic cylinder best suited to your particular application.

Ortman-Miller offers you the full facilities and resourcefulness of its Field Organization and Engineering Staff without cost or obligation.

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HACKETT BROTHERS, INC. North Manchester, Indiana	H. U. ROGERS, INC. Minneapolis, Minnesota
KNOX, INC. East Walpole, Mass.	THE RUCKER COMPANY Oakland, California
H. D. MACRAE Rochester, New York	ROBERT TAYLOR & SONS Salt Lake City, Utah
THE MERCE COMPANY Milwaukee, Wisconsin	WOMACK MACHINE & SUPPLY CO. Dallas, Texas
WALTER MORRIS ENGR. CO. Chicago, Illinois	ZOPP ENGINEERING CO. Kansas City, Missouri



O-M tie-rodless (Round Line) air and hydraulic cylinders — rated to 500 psi Air; to 1500 psi Hydraulic. Series TH (Square Line) hydraulic cylinders — rated to 2000 psi.

Both lines of cylinders are available in complete range of sizes (1 1/2" to 8" bores) with standard or oversize rods.



ORTMAN-MILLER MACHINE CO.

17 143rd Street, Hammond, Indiana

- ☐ Have Field Representative call
- ☐ Send Bulletin 105 (Square Line)
- ☐ Send Bulletin 101A (Round Line)

Name _____ Position _____
Company _____
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THIS **PAASCHE** GUN IS A



CONSULT YOUR CLASSIFIED DIRECTORY
FOR NEAREST PAASCHE REPRESENTATIVE
OR WRITE FOR INFORMATIVE BULLETIN.

PERFECT BALANCE: The Paasche Model 21 has a compact head, a generous two-finger trigger with easy pull and a comfortable handle—all in perfect balance.

INFINITE SPRAY PATTERN ADJUSTMENT: The new dual purpose air valve permits the use of air from horn holes only, center air cap holes only, or an intermixture of any proportion from these sources. The atomizing air control and the fan control afford infinite pattern adjustment with a minimum number of air caps.

BUILT FOR HEAVY USE: The one-piece heat-treated aluminum forged shell can really take abuse. Tough, durable anodized finish with chrome-plated drop forged brass fluid body make this a handsome gun that will not show wear. All internal metal parts are stainless steel. Teflon packing materials are self-lubricating, will not dry out.

ECONOMY OF OPERATION: Large, unrestricted air passages of short travel through the gun assure high volume of air atomizing even the heaviest materials at lower pressures.

EASY MAINTENANCE AND SERVICING: Gun body is well-rounded and highly polished making it easy to wipe clean. Cartridge type air valve assembly is easily removed for repair or replacement if ever required.

PAASCHE Has Been "First" More Than Any Other Spray Painting Equipment Manufacturer

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Perfect Balance, Smooth Action, Infinite Spray Pattern Control . . .

A Gun That Inspires Full Pride in Workmanship



4

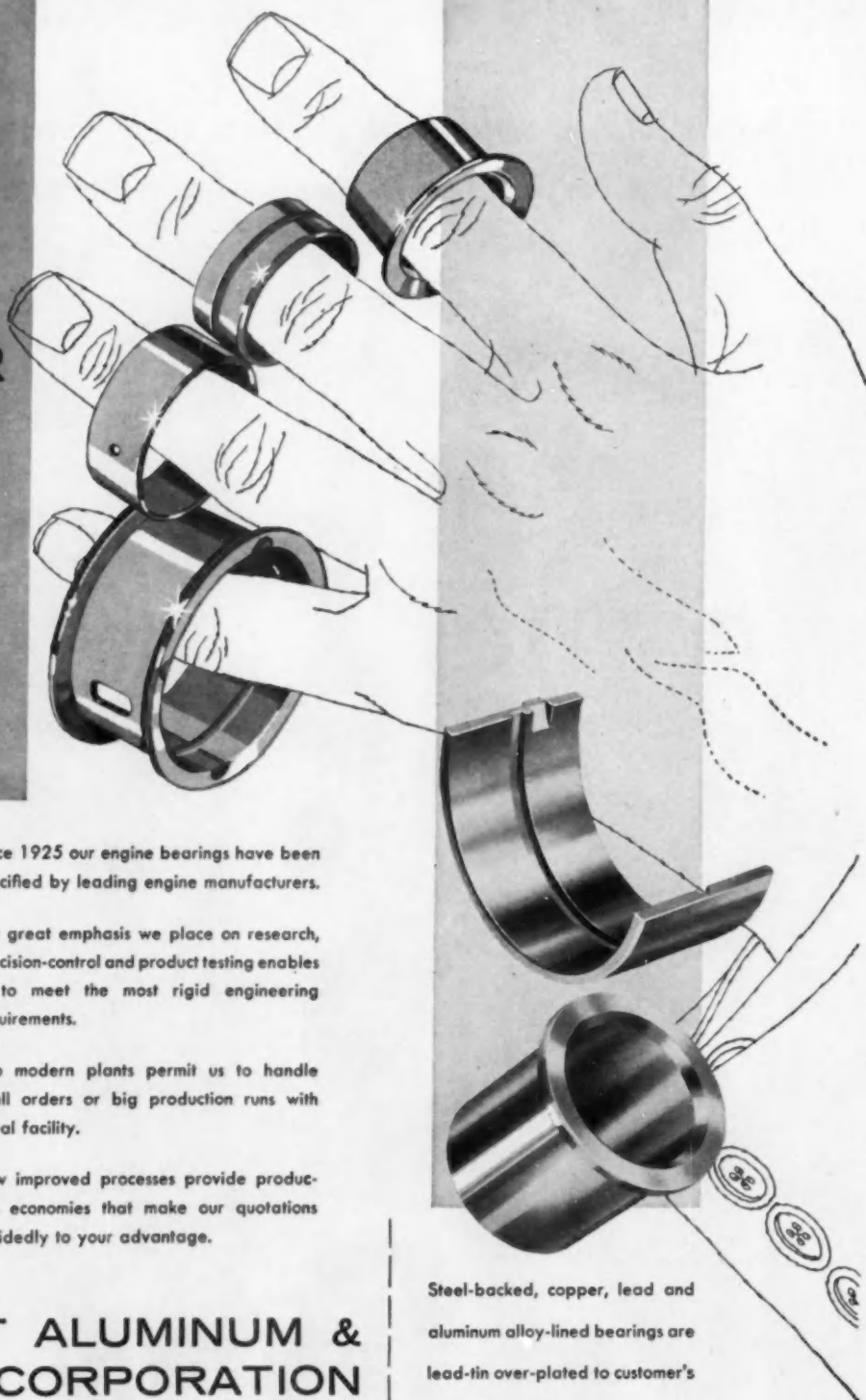
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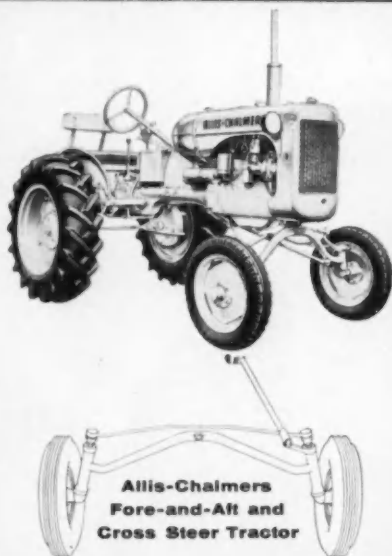
DETROIT ALUMINUM & BRASS CORPORATION

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Plants at Detroit, Michigan and Bellefontaine, Ohio



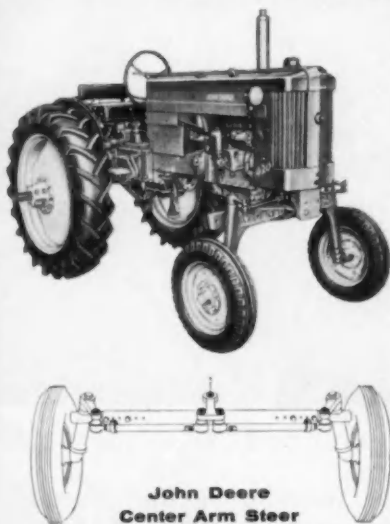
Steel-backed, copper, lead and aluminum alloy-lined bearings are lead-tin over-plated to customer's specifications.



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Fore-and-Aft and
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LEADING farm equipment manufacturers use Thompson Products for their steering linkage requirements. New uses for farm machinery, the farmer's desire for easier steering, new designs, and other important developments . . . all have necessitated better and more complicated steering systems. Thompson engineers have worked hand-in-hand with manufacturers to provide the varied steering linkage necessary for modern farm machinery.

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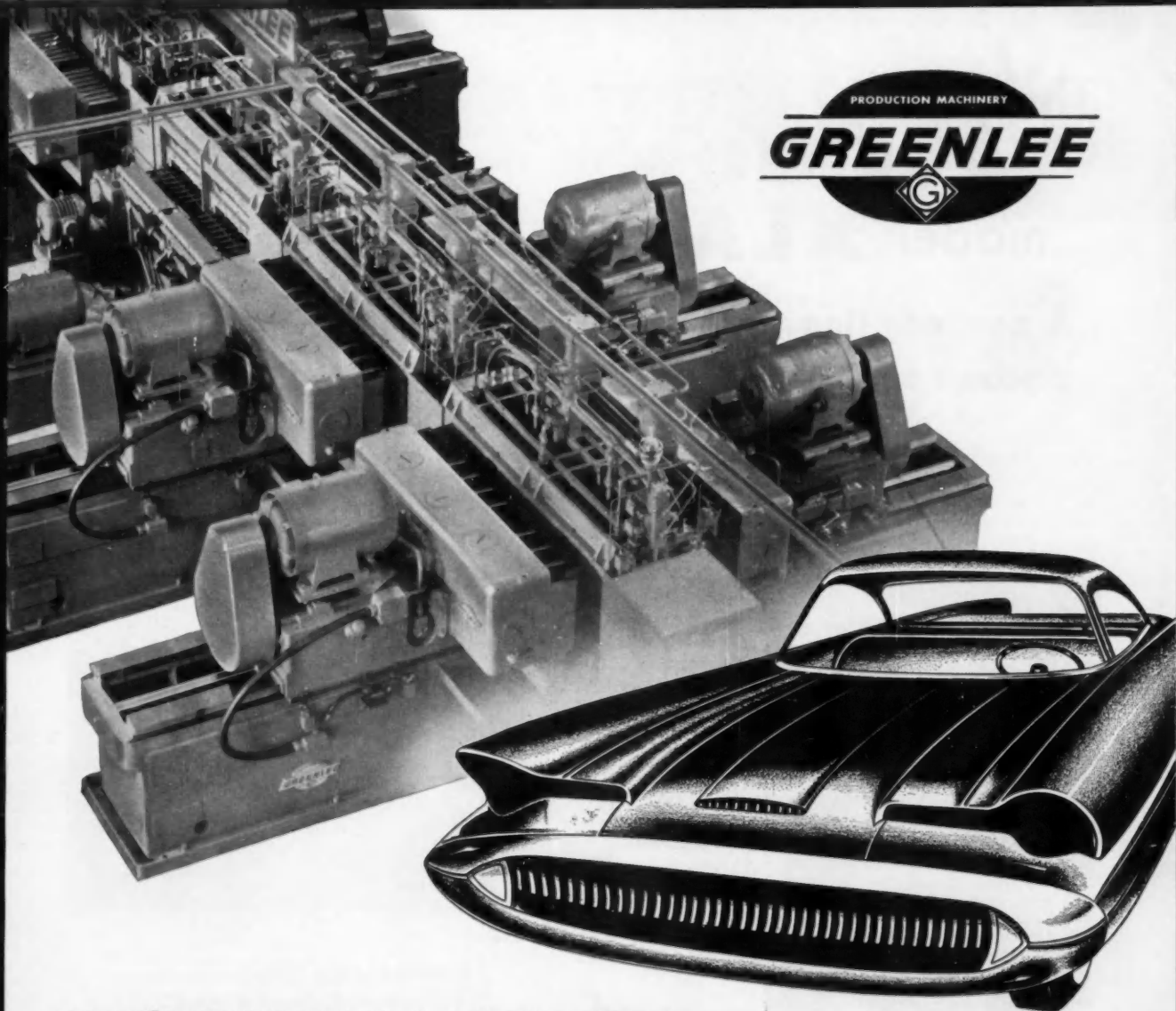
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A new addition to the HILL ACME line of heavy duty precision equipment—RUGGED, ACCURATE, LOW PRICED

The ACME Model XLA Threader is a low cost, heavy duty threading machine designed for either maintenance work or for production operations when equipped with automatic features. The ACME XLA is built in single and double spindle design in sizes of 1", 1½", 2" and 2½" capacity.



ACME Model XLA Threaders can be equipped with either the "HILLCO" Tangential Die Head, for production work, or with the "ACME" Hob Type head for maintenance operations. This precision machine with its amazing versatility is priced to fit YOUR budget.

Bulletin XLA gives complete details.



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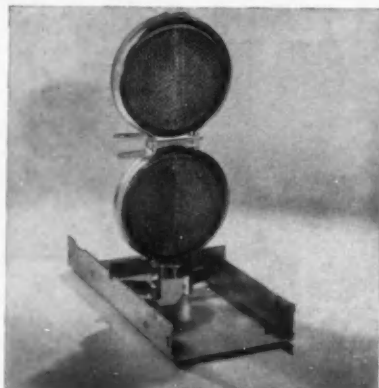
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AUTOMOTIVE ENGINEERING

PROPERTY AND APPLICATION DATA
ON THESE VERSATILE ENGINEERING MATERIALS:
"TEFLON," "LUCITE."

NEWS

Dec. 5, 1956

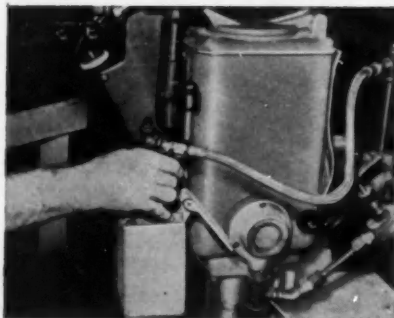


VARI-Flare manufactured by VARI-Products Company, Chicago, Illinois. Reflectors molded by Stimsonite Division of the Elastic Stop Nut Corporation of America, Union, New Jersey.

Reflectors of Du Pont LUCITE® provide safer highway travel

LUCITE acrylic resin helps eliminate "sitting ducks"—cars or trucks stalled on the highway which don't warn oncoming vehicles of their predicament. The portable VARI-Flare pictured above provides the necessary warning in such cases. Its reflectors, injection-molded of Du Pont LUCITE, can be seen for a half mile or more.

LUCITE offers excellent opportunities for the automotive designer. It is available in a wide range of transparent, translucent, and opaque colors and can be molded into almost any size or shape. For more information on how this versatile material can help you with your design problems, clip and mail this coupon.



Hose lined with TEFLON is virtually unaffected by corrosive materials, despite constant flexing, over a broad temperature range. (Manufactured by Resistoflex Corp., Roseland, N. J.)

Unusual properties of Du Pont TEFLON® offer many mechanical design advantages

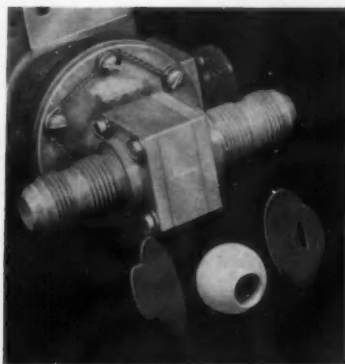
The unusual mechanical and chemical properties of TEFLON tetrafluoroethylene resin make it particularly adaptable to automotive applications. Used as thrust washers in trailer-hinge assemblies, TEFLON has withstood the wear of heavy, swinging doors and weathering for over five years, without replacement. Hose lined with TEFLON retains its flexibility and is unaffected by high-temperature fuels and other corrosive materials. Ball valve seals made of TEFLON demonstrate its ability to retain original size in contact with hydraulic fluids, water, air and other elements which would cause conventional materials to swell. Clamps using a liner impregnated with TEFLON are completely unaffected by all hydraulic fluids, lubricating oils and fuels. Because of the low coefficient of friction of TEFLON, these clamps can allow for rotational or longitudinal movement. These examples are typical of the success that can be achieved when using TEFLON

in mechanical applications.

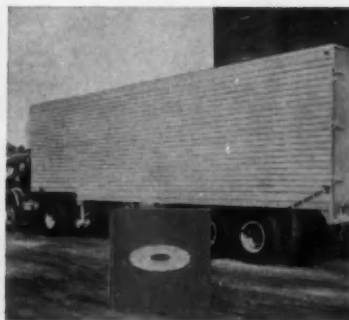
Basic property and application data on TEFLON tetrafluoroethylene resin is available to you. It will help you to evaluate this material for your own use. Simply clip and mail this coupon.



"Joelamps," initially developed for the aircraft industry, use liners impregnated with TEFLON for excellent chemical stability and age resistance, over a wide temperature range. Will not char or carbonize. In this and other applications, the self-lubricating characteristics of TEFLON assume importance. (Manufactured by the Joelin Manufacturing Company, North Haven, Connecticut.)



Molded ball seals of TEFLON provide tight, long-lasting seals for valves handling hydraulic fluids, water or air. (Manufactured by the Sparta Manufacturing Company, Dover, Ohio.)



Thrust washers used in trailer-door hinges are made of TEFLON. They stand up to rugged usage and require no lubrication. (Made by Brown Trailers Inc., Spokane, Washington.)

NEED MORE INFORMATION?

For further details that will help you further evaluate these materials for use in your product development program, mail the coupon at the right.

E. I. du Pont de Nemours & Co. (Inc.)

Polychemicals Department, Room 1710, Du Pont Building, Wilmington 98, Delaware

Please send me more information on Du Pont "Teflon" tetrafluoroethylene resin and "Lucite" acrylic resin. I am interested in evaluating this material for_____

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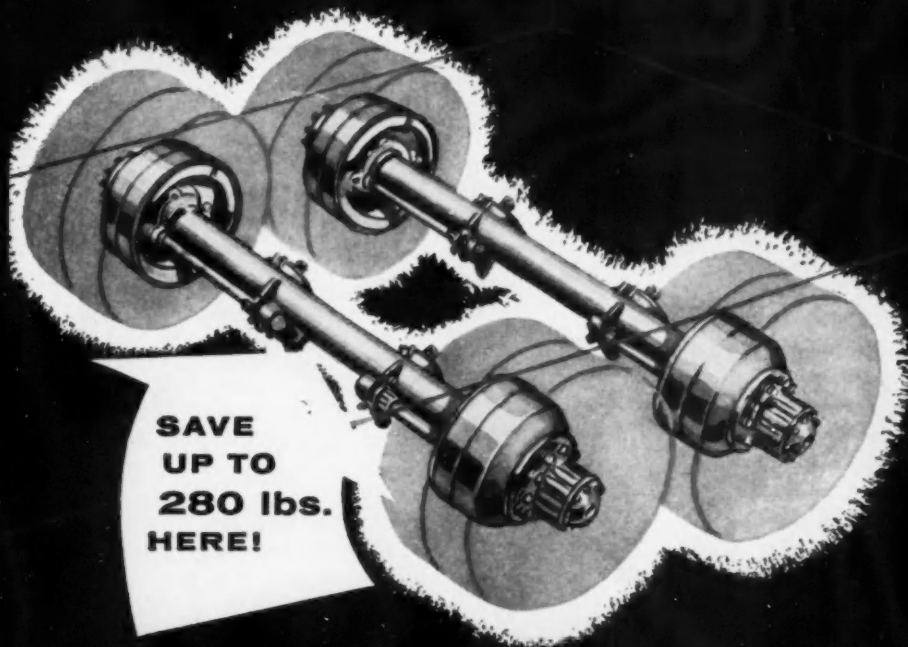
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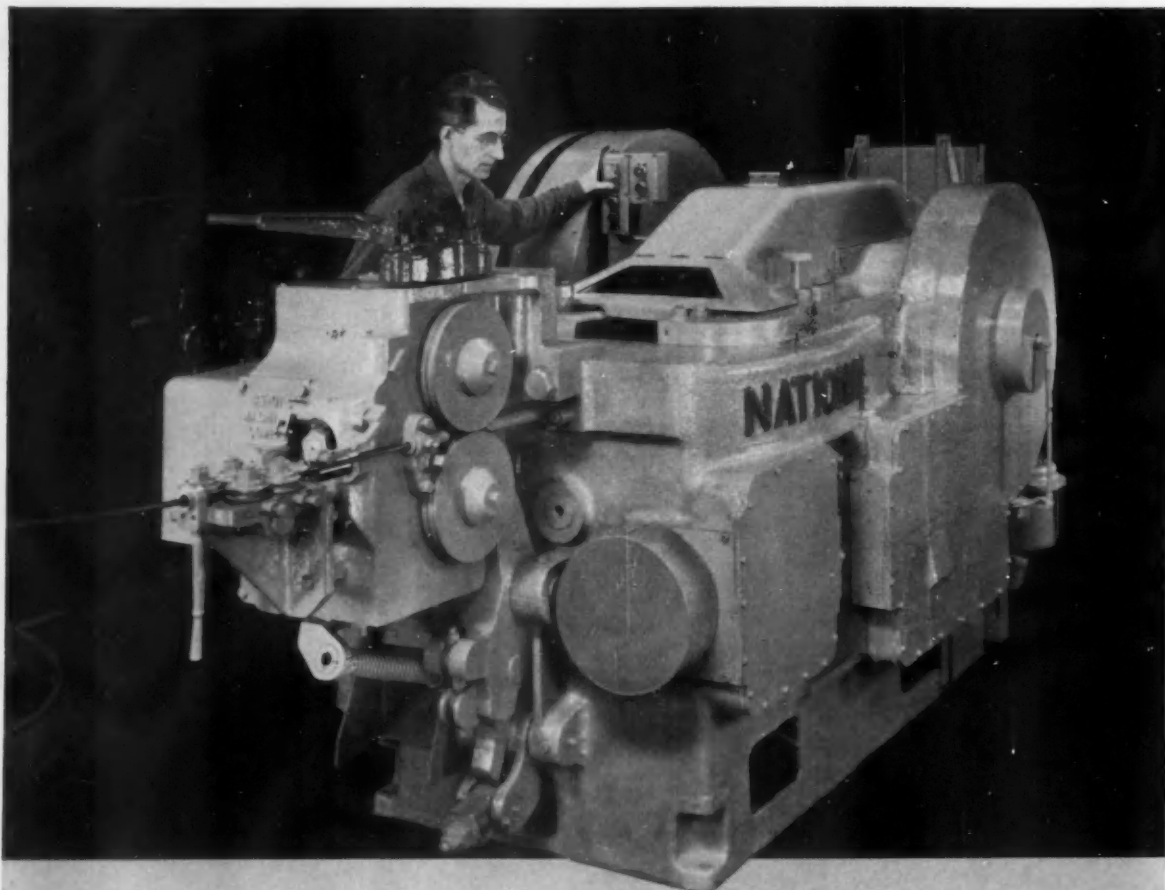


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when you use the combination of new, lightweight
TDA® Tandem Driving and Trailer Axles!*

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*Where 36,000 lb. tandem axle loading is permissible.



NATIONAL COLD HEADERS NOW AVAILABLE AT NEW HIGHER SPEEDS!

Standard-stroke National Cold Headers now operate at new higher speeds, as a result of dynamic counterbalancing and improved design of critical moving parts.

For example, the new $\frac{3}{8}$ " DSSD headers, like the one shown above, are producing 135 pieces per minute! Tool life is better and maintenance is still lower than on the earlier $\frac{3}{8}$ " models which operated at 100 pieces per minute.

Of course, all the time-proved advantages of National Headers still apply:

1. Easier, quicker to set up and adjust.
2. Compact construction; minimum floor space.
3. Simplicity — minimum of parts and movements.
4. Rigidity — for accuracy and maintenance of adjustment.
5. Die-engineering and development assistance.

We invite you to our plant to investigate how latest-design National Headers — and other National hot- and cold-process Machinery — can bring you new advantages through the fast, automatic production of your forged metal fasteners and components.

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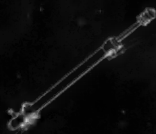
The Greatest name in Ride Control



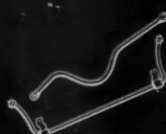
MONRO-MATIC SHOCK ABSORBERS — Standard on more makes of cars than any other brand.



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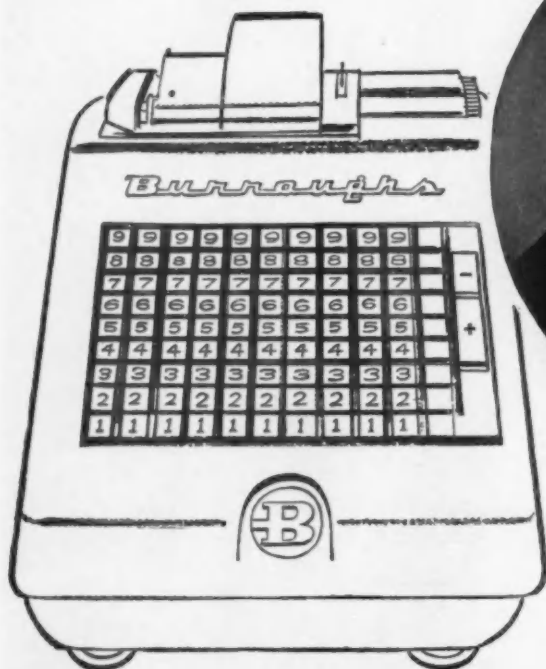
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How Mayari R adds sales appeal to Hackney bodies

In the highly competitive market for delivery truck bodies, the body-maker is ever on the alert for sales features to build into his product. Hackney Brothers Body Company, century-old firm in Wilson, N. C., puts the structural advantages of Mayari R high-strength, low-alloy steel to good use in adding sales appeal to Hackney bodies.

They made the corner posts for this ice cream truck body of Mayari R in order to secure higher strength and higher resistance to "dinging" without increasing body weight. Other framing members of this same body are fabricated from Mayari R to reduce weight without sacrificing strength.

These results are possible because Mayari R sheet has a yield point considerably higher than that of

carbon structural steel. In addition, Mayari R has far superior resistance to corrosion, holds paint up to 80 per cent longer, and has excellent impact properties. It is readily weldable by all the usual methods.

Throughout the automotive industry, more and more vehicle manufacturers are using Mayari R for framing members, gussets, roof bows, side sheets and other parts in which strength and weight are critical factors. Our Catalog 353 illustrates the wide range of automotive applications for Mayari R. You can get a copy promptly through the Bethlehem district sales office nearest you.

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. *Export Distributor:* Bethlehem Steel Export Corporation



Mayari R... High-Strength, Corrosion-Resisting Steel

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If you are doing any amount of deep drawing, you cannot afford to be without the services of this amazing unit. Let our sales engineers put you in contact with a user in your area . . . a few minutes of your time will convince you of its value. **The McKay Machine Company, Youngstown, Ohio.**

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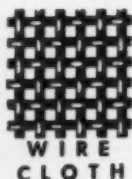
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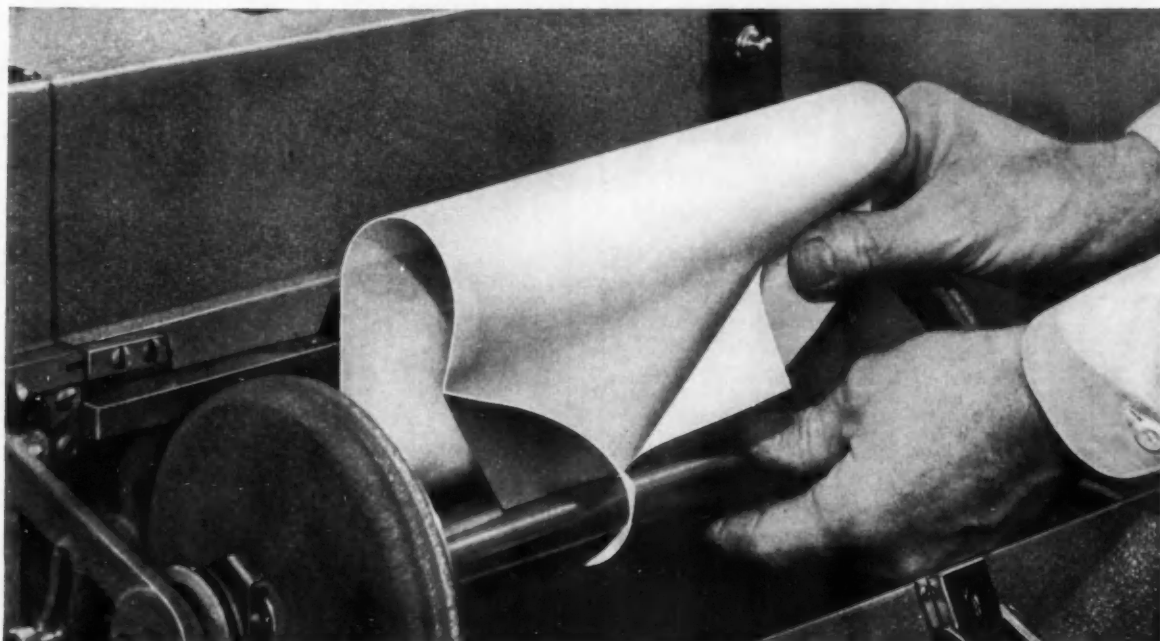
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Photo Products Department
E. I. du Pont de Nemours & Co. (Inc.)
Wilmington 98, Delaware

The man above is loading a machine with extra-thin Du Pont Lino-Writ 3 photorecording paper (Type W). You can see how flexible it is — how easy it is to handle. But, of equal importance, extra-thin Lino-Writ 3 provides almost 50% more paper per loading than the standard rolls normally used.

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Lino-Writ photorecording papers are available in three speeds and two weights to satisfy your specific needs. For further information about Du Pont Lino-Writ 3 and Du Pont processing chemicals simply call Western Union Operator 25, who will give you the name, address and telephone number of your nearest dealer.



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WRITE for Circuit Bulletin and Catalog G-106

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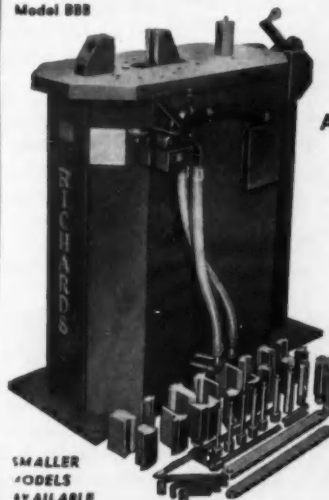
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Multiform BIG BROTHER BENDER

Model BBS



Illustrated above are a few of the many forms that can be produced efficiently on the Multiform Bender.



SMALLER MODELS AVAILABLE

AIR OPERATED MODELS IN FOUR SIZES

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SPECIAL NUTS

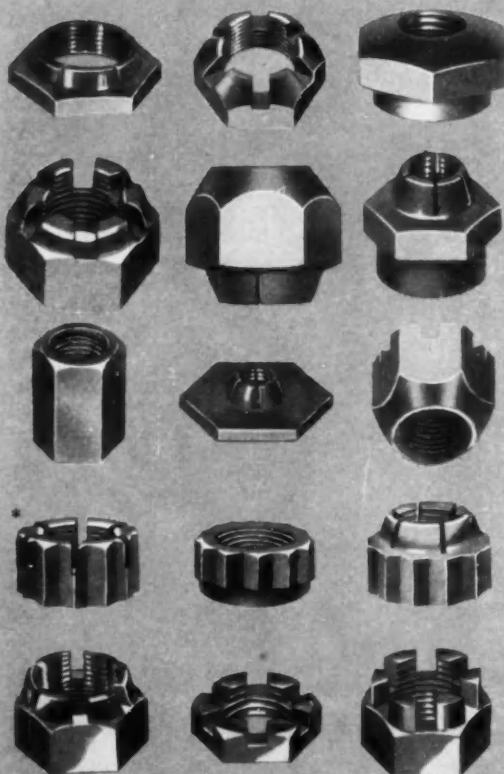
to specs. 7/16" - 4-1/4" cross flats

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*Also 12 Pointer brochure on request.

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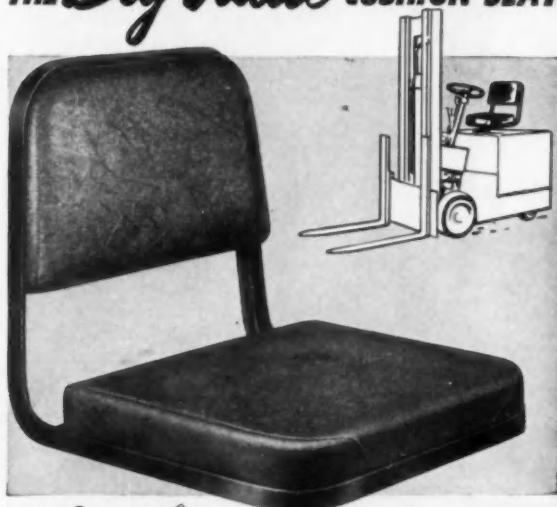
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